DOCUMENT RESUME

ED 427 953 SE 062 087

AUTHOR George, Yolanda S.; Van Horne, Virginia V.
TITLE Science Education Reform for All (SERA): A Look at How State Departments of Education Are Infusing Equity and Excellence into PreK-12 Systemic Reform.
INSTITUTION American Association for the Advancement of Science, Washington, DC.
SPONS AGENCY Carnegie Corp. of New York, NY.
ISBN ISBN-0-87168-598-1
PUB DATE 1996-00-00
NOTE 79p.
AVAILABLE FROM American Association for the Advancement of Science, Directorate for Education and Human Resources Programs, 1200 New York Avenue NW, Washington, DC 20005-3290.
PUB TYPE Reports - Descriptive (141)
EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Curriculum Development; *Educational Change; Elementary Secondary Education; *Equal Education; Evaluation Methods; Females; Minority Groups; *Position Papers; Preschool Education; *Science Education
IDENTIFIERS American Association for Advancement of Science; Florida; Michigan; South Dakota; *Systemic Educational Reform

ABSTRACT

This report reviews policies, practices, and strategies that state departments of education are using to infuse equity and excellence into their ongoing science, mathematics, and technology systemic reform efforts. Lessons learned and discussed are primarily from state departments of education in Florida, Michigan, and South Dakota. In addition, some information is gathered from other states that are participating in the National Science Foundation Statewide Systemic Initiative (SSI). some of the reform-related materials from Florida and South Dakota are appended. (DDR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

SCIENCE EDUCATION REFORM FOR ALL (SERA)

A LOOK AT HOW STATE DEPARTMENTS OF EDUCATION ARE INFUSING EQUITY AND EXCELLENCE INTO PREK-12 SYSTEMIC REFORM

ED 427 953

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

N. Bell

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Yolanda S. George

Virginia V. Van Horn

BEST COPY AVAILABLE

Science Education Reform for All (SERA)

A Look at How State Departments of Education Are Infusing Equity and Excellence into PreK-12 Systemic Reform

Yolanda S. George

Virginia V. Van Horne

American Association for the Advancement of Science

Funded by Carnegie Corporation of New York

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Founded in 1848, the American Association for the Advancement of Science (AAAS) is the world's largest federation of scientific and engineering societies, with nearly 300 affiliated organizations. In addition, AAAS counts more than 142,000 scientists, engineers, science educators, policy makers, and interested citizens among its individual members, making it the largest general scientific organization in the world.

The Directorate for Education and Human Resources Programs (EHR) seeks to improve education in mathematics, science, and technology; foster equal access to these fields for women, minorities, and people with disabilities; and enhance the public's understanding of all areas of science and technology.

About the American Association for the Advancement of Science (AAAS) Science Education Reform for All (SERA) Project

The objective of the AAAS SERA Project is to develop a technical assistance program for state departments of education or state education agencies (SEAs). This program would ensure that the benefits of science/mathematics education reform efforts would accrue equitably to all students, particularly low-income minority students and inner-city students. Partners in this effort include the Collaboration for Equity: Fairness in Science and Mathematics Education; the Council of Chief State School Officers (CCSSO); the National Science Foundation (NSF) Office of Systemic Reform; the Education Development Center (EDC); and the Technical Assistance Team to the NSF Statewide Systemic Initiative (SSI) sites, Westat*McKenzie Consortium. This technical assistance program is being field tested with three sites: Florida, Michigan, and South Dakota. Specific activities include the following:

- Encouraging chief state school officers and district superintendents to coordinate the planning and implementation of science, mathematics, and technology (SMT) education; U.S. Department of Education programs; and other reform efforts.
- Encouraging leaders of professional development programs for teachers to rethink their approaches to these programs, approaches that include SMT content, pedagogy, and assessment training coupled with equity and diversity training.
- Conducting strategy sessions with the leaders and policymakers of systemic reform efforts about science and mathematics education equity issues, including leadership meetings with education policy associations.
- Encouraging SEAs and school districts to create a cadre of change agents in community-based organizations (CBOs), i.e., knowledgeable individuals who can play a role in education reform and restructuring, particularly as it relates to SMT for children in low-income communities, especially minorities, girls, and those with disabilities.

Any interpretations and conclusions are those of the authors and do not necessarily represent the views of the AAAS Board of Directors, the Council of AAAS, the staff or the membership of the association, nor the Carnegie Corporation of New York.

Additional copies can be obtained by contacting:

AAAS
Directorate for Education and Human Resources Programs
1200 New York Avenue, NW
Washington, DC 20005-3290
202-326-6670
202-371-9849 Fax

©1996 American Association for the Advancement of Science
ISBN 0-87168-598-1

Contents

Acknowledgments *iv*

Preface *v*
Shirley M. Malcom
Cynthia G. Brown

List of Acronyms *vii*

Executive Summary *1*

Case Studies

Florida • A Look at How Florida Is Infusing Equity and Excellence into Systemic Reform *15*

Michigan • A Look at How Michigan Is Infusing Equity and Excellence into Systemic Reform *25*

South Dakota • A Look at How South Dakota Is Infusing Equity and Excellence into Systemic Reform *37*

Appendices *47*

I. Discover Science and Mathematics in Florida: Choosing Quality Mathematics & Science Materials and Programs *47*

II. South Dakota Equity Standards in Education *59*

III. Brief Descriptions of Several Equity Projects Referenced in Text *67*

IV. List of Participants at State SERA-Sponsored Meetings *73*

V. List of Participants at Equitable and Excellent Education for Girls Meeting *77*

Acknowledgments

This report resulted from the combined effort, hard work and contributions of a plethora of individuals. Some were involved directly in the gathering and processing of data and information, while others provided that information. Through diligent teamwork, site visits, telephone conversations, and research, the executive summary and case studies were produced. We would also like to thank our funder, the Carnegie Corporation of New York, as well as our program officer, Karin P. Egan, who made the SERA project possible.

We are grateful to the many staff members within the Florida Department of Education, the Michigan Department of Education, and the South Dakota Department of Education and Cultural Affairs for their assistance in providing answers as well as referring us to other state agencies and/or organizations for information. Needless to say, the list of individuals who provided assistance is too large to print in its entirety. We would, however, like to especially thank the following persons: Thomas Baird, Robert Berendt, Bernard Charles, Cynthia G. Brown, Janice Earle, Thomas Fisher, Eric Jolly, Sharon Koon, Juliá Lara, Okhee Lee, Janet Martin, Carolee Matsumoto, Nancy Mincemoyer, William Pearson, Stephanie Robinson, Deb Rumrill, James Spillane, Gwendolyn Taylor, and Julia Wan.

PREFACE

Improving the quality of science, mathematics and technology education that all children receive remains the single greatest challenge in school reform. The difficulties are related to many factors including the structure of the curriculum, the preparation of the teachers in content and pedagogy, and the expectations of the students by teachers, counselors, administrators, parents, and children themselves.

Until recently the efforts at reform were piecemeal. Some reformers focused on the nature of curriculum but said little about assessments. Others focused on the preparation of teachers with little emphasis on the organization of the schools where they would work. Still others sought to address the organization of schools with less attention to the knowledge, skills, and ideas they would attempt to pass on to students or to the larger community where they would spend most of their time.

Systemic reform has been powerful as a concept in reinforcing the idea that the parts of the educational system work together and that they must all be aligned in a coherent way in order to achieve reform. But, the equity goals have often been difficult to fit into the vision and implementation of SMT education reform. Those who work with programs designed to "level the playing field" have had limited access to the conversations around standards based reform in mathematics and science, while those working on standards based reform often have few working models to help them understand the implication of challenging all students with more rigorous coursework, expecting and accomplishing higher levels of achievement from all.

All too often reform activities have worked at "cross purposes," leaving a confused message with teachers, parents, and students alike. Putting all the players into the same discussion, providing assistance with new tools and technologies, and developing indicators to guide practice and monitor performance are the next steps to accomplish excellence and equity in science, mathematics, and technology education reform.

While this is good rhetoric, the skills that are required to actually make this happen are uncommon:

- to understand that every decision regarding the deployment of people and use of resources, no matter how benign each may seem on its surface, has equity implications, some of which can and must be anticipated
- to envision how the aggregated effects of little decisions can support a trajectory of reform
- to identify the high leverage activities (assessment, certification, licenses) within systems and to ensure that they are affected early on
- to support behaviors and discussions that go across and beyond self-interest
- to celebrate goals that are met and to consider set backs as problems to be solved rather than insurmountable obstacles
- to be honest about shortfalls, generous with assistance, willing to accept responsibility and to be held accountable
- to use available research to guide practice and policies, to do the things that work and to stop doing the things that don't work.

The ultimate test of any reform is whether all students acquire the knowledge, skills, ideas, and habits of mind that they must have to be productive citizens in the 21st century. Anything short of this cannot be acceptable.

While resources are essential to achieving such ambitious goals, it is also true that smarter deployment of the resources we have is possible. Doing better with what we have will allow us to make a case for what we need.

Partnerships across different parts of the community are essential aspects of systemic reform. Only when schools, families, communities, businesses, higher education, cultural institutions, and government at all levels collectively signal high expectations and

collectively help to effect high quality education can we pull together the wisdom and the clout we need to make science education reform truly work for all.

Organizations, such as AAAS, agencies, and foundations have a role to play by supporting, facilitating and encouraging activity, providing assistance and being a critical friend. Real reform only happens when it takes root closest to the children. Encouraging and supporting the conditions for that reform is the responsibility of us all.

Shirley M. Malcom
Director of Education and Human Resources
American Association for the Advancement of Science

As states work to ensure that all students reach challenging academic standards through their schooling and out-of-school supports, they must give special attention to those groups of students who historically have received inadequate educational opportunities. No where is this more important than in the curriculum areas of science, math, and technology, those "tough" courses that are so essential for every student to master if she or he is to be appropriately prepared for the challenges of the 21st century. This report, *Science Education Reform for All (SERA): A Look at How State Departments of Education Are Infusing Equity and Excellence into PreK-12 Systemic Reform*, provides essential guidance for state leaders as they undertake efforts to enable low-income, minority, disabled, limited English proficient, and female students to be fully engaged in science, math, and technology education.

It has been a privilege for the CCSSO to be a partner in this work with the AAAS. We look forward to assisting in the follow-up and application of the principles and examples of exemplary practice that are highlighted in this document.

Cynthia G. Brown
Director
Resource Center on Educational Equity
Council of Chief State School Officers

List of Acronyms

AAAS • American Association for the Advancement of Science

ADA • Americans with Disabilities Act

AP • Advanced Placement

CBO • Community-Based Organization

CCSSO • Council of Chief State School Officers

CPMSA • Comprehensive Partnerships for Mathematics and Science Achievement

CPRE • Consortium for Policy Research in Education

EDC • Education Development Center

EEOA • Equal Employment Opportunity Act

EEOP • Equal Educational Opportunity Program

EHR • Education and Human Resources

ESEA • Elementary Secondary Education Act

ESOL • English for Speakers of Other Languages

FCAT • Florida Comprehensive Assessment Test

IEP • Individual Education Plan

LEA • Local Education Agency

LEP • Limited English Proficient

MEAP • Michigan Education Assessment Program

MLT • Mean Length of Turn

MSC • Mathematics and Science Consortium

MSSI • Michigan Statewide Systemic Initiative

NAEP • National Assessment of Educational Progress

NCREL • North Central Regional Educational Laboratory

NCTM • National Council of Teachers of Mathematics

NSF • National Science Foundation

NSTA • National Science Teachers Association

PA • Public Act

PDP • Professional Development Program

PI • Principal Investigator

PTA • Parent Teacher Association

R&D • Research and Development

RSI • Rural Systemic Initiative

SAT • Scholastic Aptitude Test

SSI • Statewide Systemic Initiative

SCASS • State Collaborative on Assessment and Student Standards

SEA • State Education Agency

SERA • Science Education Reform for All

SLIC • Science Linkages in the Community

SMT • Science, Math, and Technology

TIE • Technology and Innovations in Education

USI • Urban Systemic Initiative

Science Education Reform for All (SERA)
A Look at How State Departments of Education (SEAs) Are Infusing Equity and Excellence into PreK-12 Systemic Reform

EXECUTIVE SUMMARY

State departments of education or state education agencies (SEAs) are continuously grappling with how to create an equitable education system that includes flexible policies and practices which take into account the needs of each student regardless of race/ethnicity, gender, disabilities, family background, religion, and community/school resources. This goal becomes even more daunting when SEAs are charged with infusing equity and excellence into challenging science and mathematics curricula at the PreK, elementary, and secondary school levels, curricula to which many minority, female, and economically disadvantaged children or those with disabilities have received little or no exposure.

This AAAS report looks at policies, practices, and strategies that SEAs are using to infuse equity and excellence into their ongoing science, mathematics, and technology (SMT) systemic education reform efforts. The lessons learned and discussed in this report are primarily from SEAs located in Florida, Michigan, and South Dakota. In addition, some information is gathered from other states that are participating in the National Science Foundation (NSF) Statewide Systemic Initiative (SSI). Using discretionary funds from the National Science Foundation and the U.S. Department of Education, these three SEAs and others are speeding up local reform by providing planning grants and technical assistance to selected school districts or local education agencies (LEAs). The types of technical assistance provided by SEAs and partnering organizations includes:

- producing SMT curriculum standards, frameworks, and multiple assessment guides using National Council of Teachers of Mathematics (NCTM) Standards; American Association for the Advancement of Science (AAAS) Project 2061 *Benchmarks*; National Science Teachers Association (NSTA) *Scope, Sequence and Coordination*; the National Research Council *Science Education Standards*; and *New Standards Performance Standards* in Mathematics and Science.
- providing planning seminars and technical support for school superintendents and district administrators, school principals and administrators, lead teachers, and community and business leaders.
- strengthening and/or establishing the regional K-12 SMT in-service teacher training centers and sites.
- writing and disseminating curricula, reform guides, and toolkits for use in the planning and implementation of curricula and assessment by school districts.

In terms of SMT systemic reform, services provided by SEAs to LEAs are guided by the following expectations of the NSF Office of Systemic Reform:

(1) implementation of comprehensive, standards-based education for all students, including alignment of curriculum, instruction, and assessment and provisions for long-term in-service and preservice teacher development. Guidance by NSF, AAAS, and others is particularly critical during the development and implementation of standards-based science and mathematics, since these subjects have traditionally received little or no attention in most of the LEAs that serve children in high poverty areas. In addition, teachers and administrators in U.S. Department of Education's categorical programs are not certain as to how the Improving America's School Act (reauthorization of the Elementary and Secondary Education Act) affects them, in particular, how it applies to SMT education.

(2) development of coherent and consistent policies that support high quality SMT education for all, including policies related to SMT courses needed for high school graduation, admissions to higher education, and teacher licensing. Increases in state graduation requirements in mathematics and science, changes in state curricular guidelines, and

other factors appear to have increased the taking of SMT courses by high school students, particularly in biology and chemistry (Table 1) and algebra and geometry (Table 2).

(3) convergence of all resources that could be used for SMT education reform. Because school financing comes from a variety of sources (state, local, federal, and private), school boards, superintendents, program administrators, and principals have to piece together funds for a coordinated and integrated long-range plan that will provide all schools with adequate and continuous resources for SMT teacher professional development, textbooks, supplies, equipment, and facilities in all schools.

(4) ideas for marketing SMT reform to the public, including creating more powerful metaphors about the importance of school reform and science literacy that will appeal to parents in both resource-rich and resource-poor communities as well as the general public. Table 3, the results of a survey of how interested and informed adults with baccalaureates feel about school reform issues and selected science and medical issues, indicates the need both for marketing reform and increasing public understanding of science and technology.

(5) ideas for developing a flexible, concise, and coherent data and information system that can show annual progress of systemic reform, including changes in policies, practices, and approaches as well as data on student outcomes by demographics such as race/ethnicity, gender, physical and learning disabilities, language, and family and school/community resources. Data should be disaggregated by gender within race/ethnicities. The NSF *Indicators of Science and Mathematics Education* (1995) suggest some indicators for equity and excellence standards of the learning environment (see Table 4).

TABLE 1.

PERCENT OF HIGH SCHOOL GRADUATES EARNING MINIMUM CREDITS IN SCIENCE COURSES, BY SEX, AND RACE OR ETHNIC ORIGIN: 1982 TO 1992

Course	Year	Total	Male	Female	White	Black	Hispanic
Any science	1982	97.6	97.5	97.7	97.7	98.6	95.9
	1987	98.7	98.4 (0.4)	99.0 (0.3)	98.7 (0.4)	98.7 (0.4)	98.5 (0.6)
	1990	99.4	99.2 (0.3)	99.7 (0.1)	99.5 (0.2)	99.0 (0.7)	99.3 (0.3)
	1992	99.6	99.5	99.7	99.5	100.0	99.7
Biology	1982	78.7	76.5	80.6	80.1	75.3	73.2
	1987	88.3 (0.9)	87.0 (1.2)	89.7 (0.7)	89.2 (1.0)	86.2 (1.7)	85.4 (1.7)
	1990	91.6 (0.9)	90.4 (1.0)	92.7 (0.9)	92.0 (1.0)	91.0 (2.3)	90.3 (1.4)
	1992	93.0	91.9	94.2	93.5	92.2	91.2
Chemistry	1982	31.6	32.4	30.9	34.7	22.5	16.7
	1987	44.8 (1.1)	45.9 (1.3)	43.7 (1.2)	47.7 (1.2)	29.8 (1.7)	29.4 (1.5)
	1990	49.6 (1.3)	48.8 (1.4)	50.4 (1.4)	52.3 (1.4)	40.3 (2.2)	38.8 (2.8)
	1992	55.5	54.2	56.8	58.0	45.9	42.6
Physics	1982	13.5	17.9	9.4	15.3	6.8	5.5
	1987	19.5 (0.9)	24.6 (1.0)	14.8 (0.9)	20.9 (1.0)	10.1 (1.1)	9.8 (1.1)
	1990	21.5 (0.8)	25.5 (0.9)	17.8 (0.9)	23.1 (0.9)	14.5 (1.9)	13.0 (1.3)
	1992	24.7	28.2	21.4	25.9	17.6	15.7

Notes: Standard errors appear in parentheses. Standard errors are not available for 1982 and 1992. Because of the use of a different editing procedure, the statistics shown for 1982 differ slightly from previously published figures. Credits are measured in Carnegie Units.

Source: *Indicators of Science & Mathematics Education, 1995*: National Science Foundation. 1996. page 135

To better understand how SEAs are infusing equity into SMT systemic reform, since 1994 AAAS SERA staff:

- conducted meetings with SEA and LEA administrators, staff, and teachers in both the science and mathematics areas and in U.S. Department of Education categorical programs in Florida, Michigan, and South Dakota. These SEAs were selected based on geographical location, size of state student populations, and race/ethnic and socioeconomic mix of state populations.
- collected and reviewed reports and materials from the three SEAs, including frameworks, data reports, and other SEA-commissioned reports.
- conducted telephone interviews with 32 SEA administrators and SMT project directors in the three states.
- attended and participated in NSF systemic reform meetings for SSI sites related to equity.
- gathered information from four NSF SSIs (Arkansas, California, New Jersey, and Texas) that are participating in the NSF-funded Collaboration

TABLE 2.

PERCENT OF HIGH SCHOOL GRADUATES EARNING MINIMUM CREDITS IN MATHEMATICS COURSES, BY SEX, AND RACE OR ETHNIC ORIGIN: 1982 TO 1992

Course	Year	Total	Male	Female	White	Black	Hispanic
Any mathematics	1982	99.0	99.4	98.7	99.1	99.6	98.6
	1987	99.4	99.3 (0.2)	99.4 (0.1)	99.3 (0.2)	99.5 (0.2)	99.4 (0.2)
	1990	99.6	99.4 (0.2)	99.7 (0.1)	99.7 (0.1)	98.7 (0.7)	99.8 (0.2)
	1992	99.6	99.3	99.9	99.7	99.1	99.8
Algebra I	1982	68.4	66.4	70.4	71.1	61.1	59.9
	1987	76.3 (0.8)	75.3 (0.9)	77.2 (0.9)	77.7 (1.1)	70.7 (1.2)	73.1 (1.6)
	1990	77.3 (1.2)	75.6 (1.2)	78.8 (1.4)	77.2 (1.4)	77.6 (2.1)	81.4 (2.1)
	1992	79.4	80.0	78.9	79.6	78.0	84.4
Geometry	1982	48.4	48.3	48.5	53.9	30.3	29.0
	1987	61.5 (0.9)	61.2 (1.2)	61.7 (1.0)	65.1 (1.2)	44.0 (1.9)	40.2 (1.7)
	1990	64.7 (1.3)	63.9 (1.5)	65.4 (1.3)	67.2 (1.4)	56.3 (2.7)	54.4 (2.8)
	1992	70.4	69.0	71.7	72.6	60.4	62.9
Algebra II	1982	36.9	37.5	36.3	40.5	26.2	22.5
	1987	47.1 (1.8)	45.8 (1.9)	48.4 (1.9)	51.9 (1.9)	32.4 (1.5)	30.2 (2.0)
	1990	49.2 (1.4)	47.8 (1.5)	50.5 (1.5)	52.4 (1.7)	39.0 (2.9)	38.6 (2.7)
	1992	56.1	54.0	58.1	59.2	40.9	46.9
Trigonometry	1982	12.2	13.3	11.2	13.8	6.3	6.8
	1987	19.0 (1.5)	20.3 (1.8)	17.8 (1.4)	20.9 (1.8)	10.9 (1.1)	9.9 (0.9)
	1990	18.4 (1.3)	18.4 (1.4)	18.3 (1.3)	19.6 (1.4)	14.1 (1.9)	11.0 (1.5)
	1992	21.1	21.4	20.8	22.5	13.0	15.2
Calculus	1982	4.3	4.7	4.0	5.0	1.4	1.6
	1987	6.2 (0.4)	7.7 (0.6)	4.7 (0.4)	5.9 (0.4)	2.3 (0.4)	3.6 (0.7)
	1990	6.6 (0.5)	7.7 (0.6)	5.6 (0.4)	7.0 (0.5)	2.8 (0.5)	3.9 (0.7)
	1992	10.1	10.3	9.8	10.7	6.9	4.7

Notes: Standard errors appear in parentheses. Standard errors are not available for 1982 and 1992. Because of the use of a different editing procedure, the statistics shown for 1982 differ slightly from previously published figures. Credits are measured in Carnegie Units.

Source: *Indicators of Science & Mathematics Education, 1995*; National Science Foundation, 1996, page 136.

TABLE 3.

PUBLIC INTEREST IN AND KNOWLEDGE OF SELECTED ISSUES AMONG ADULTS HOLDING BACHELOR'S DEGREES, BY RACE/ETHNICITY: 1993

(IN PERCENTAGES)

Issue area	Degree of interest[1] and knowledge[2]	Black	Hispanic	Other[3]
Local school issues	Very interested	68	59	48
	Moderately interested	26	31	42
	Not at all interested	6	10	11
	Very well-informed	47	32	29
	Moderately well-informed	39	47	47
	Poorly informed	14	21	24
Information about health	Very interested	76	70	59
	Moderately interested	23	25	38
	Not at all interested	1	5	3
	Very well-informed	40	35	32
	Moderately well-informed	55	55	62
	Poorly informed	5	10	6
New scientific discoveries	Very interested	37	51	45
	Moderately interested	57	40	51
	Not at all interested	6	9	4
	Very well-informed	13	16	12
	Moderately well-informed	56	53	64
	Poorly informed	32	32	24
Economic issues and business conditions	Very interested	66	66	62
	Moderately interested	32	29	33
	Not at all interested	2	5	4
	Very well-informed	39	40	41
	Moderately well-informed	52	44	49
	Poorly informed	9	16	11
Use of new inventions and technologies	Very interested	36	45	38
	Moderately interested	57	49	56
	Not at all interested	7	7	6
	Very well-informed	9	13	13
	Moderately well-informed	58	53	54
	Poorly informed	33	34	33
New medical discoveries	Very interested	63	62	56
	Moderately interested	36	35	42
	Not at all interested	2	3	2
	Very well-informed	23	19	20
	Moderately well-informed	57	55	61
	Poorly informed	21	27	20
Environmental pollution	Very interested	49	65	50
	Moderately interested	48	30	47
	Not at all interested	3	5	3
	Very well-informed	24	25	26
	Moderately well-informed	56	64	61
	Poorly informed	20	12	13
N (unweighted)		282	221	308

[1] *"There are a lot of issues in the news and it is hard to keep up with every area. I'm going to read you a short list of issues and for each one—as I read it—I would like you to tell me if you are very interested, moderately interested, or not at all interested."*

[2] *"Now I'd like to go through this list with you again and for each issue I'd like you to tell me if you are very well-informed, moderately well-informed, or poorly informed."*

[3] All respondents not identifying themselves as African American or Hispanic American, therefore, this group includes Asians, whites, and all other groups.

Source: National Institutes of Health, 1993, Survey of Public Understanding of Biomedical Knowledge. Unpublished tabulations.

Source: *Women, Minorities, and Persons With Disabilities in Science and Engineering: 1994*. National Science Foundation, 1994, page 130.

TABLE 4.

INDICATORS FOR EQUITY AND EXCELLENCE STANDARDS OF THE LEARNING ENVIRONMENT

	Equity standard	Excellence standard	Indicator
Curriculum	Science and mathematics courses should be accessible to all students.	• Students should enroll in science and mathematics courses throughout high school. • Students should study specific content to develop an understanding of key unifying concepts.	• State curriculum frameworks • Graduation requirements • Coursetaking • Ability grouping
Teachers	Teachers of both sexes and of different races and ethnic groups should be equally well prepared and have similar approaches.	• Teachers should have a firm content background. • Teachers should have a supportive work environment that encourages reflection. • Teachers should have opportunities for professional development.	• Teacher characteristics • Teacher beliefs about teaching reforms • Teacher preparation • Teacher perceptions of their own preparation • Professional development
Instructional practices	Teacher beliefs about instruction and their instructional practices should not vary according to the race or ethnic origin of the students in the class.	**Instructional practices should require** • "minds-on" student involvement • hands-on interaction • problem-solving experiences • prolonged, in-depth contact with central or unifying concepts • a community of scholars in which both teachers and students learn and where respect is shown for student opinions and prior knowledge • communication, demonstrated by presentations of ideas and group interactions • assessment that emphasizes the process of arriving at the answer and application of knowledge to new situations	• Use of in-class time • Participation in long-term projects • Participation in other instructional activities • Use of traditional or alternative assessment techniques
Resources	Students in all classes, regardless of their race or ethnic origin, should have the same resources.	**Class should have access to** • hands-on activities • technology, including computers and calculators • appropriate textbooks • supplemental and varied resource reading materials	• Teacher ratings of textbook use and quality • Teacher ratings of and reported problems with supplies and facilities • Access to and use of computers and networks • Use of calculators

Source: *Indicators of Science & Mathematics Education, 1995*; National Science Foundation, 1996, page 35.

BEST COPY AVAILABLE

for Equity: Fairness in Science and Mathematics Education and attended a meeting co-sponsored by the Collaboration for Equity and the Council of Chief State School Officers (CCSSO). Administrators from 19 states and the District of Columbia attended the jointly sponsored meeting.

- had conversations with staff in educational policy organizations who work with SEAs, LEAs, categorical programs, and science and mathematics reformers, including CCSSO, Education Development Center (EDC), and the Education Trust.

In these meetings, interviews, and conversations, managers in SEAs were asked about the following issues:

- their definition of equity
- barriers and challenges to achieving an equitable system
- types of linkages between staff in SMT, categorical, and early childhood programs
- types of SMT content included in categorical and PreK programs
- SMT teacher professional development and equity
- SMT external collaborations and partnerships with equity-based organizations
- ability grouping
- accommodations and adaptations for limited English proficient (LEP) students and students with disabilities
- information and data management systems to measure reform.

The next section outlines the findings of those meetings, interviews, and conversations.

I. Findings

As discussed earlier in this executive summary, funding for the overall operations of SEAs comes from a variety of sources. As a result, if a statewide comprehensive and seamless SMT reform that serves the need of each student is to be implemented, then managers in SEAs must have a supportive chief state school officer. This officer must use his or her professional status to place equity and fairness at the center of internal discussions about improving the quality of education. In addition, he or she must extend these conversations to multiple constituencies within a given state. As pointed out in the summary of the Collaboration for Equity/CCSSO meeting, colleagues and policymakers must understand:

- that every policy and every aspect of systemic reform has equity implications and that all policies and practices must be assessed and reviewed to ensure that the benefits of reform will accrue to each student.
- that special projects and equity advocates can serve as a catalyst to support change. However, when an entire system adopts the goals of excellence and equity, the responsibility for justice and equality belongs to everyone. The focus on equity must be explicit or it will be lost.
- how to collect and use data to inform action. Cross-tabulating data by race/ethnicity, gender, disabilities, language, family background, and community locations and resources can help to identify the gaps and needs for specific resources.
- how to negotiate the day-to-day realities of working in SEAs, including frequent changes in leadership within SEAs, overwhelming work loads, overload of new policies, challenges to school financing, and limited resources (Consortium for Policy Research in Education (CPRE) Briefs, 1995 and 1996).

Recognizing the need to create an environment supportive of the goal of equity and excellence, SMT systemic reform managers in SEAs in Florida, Michigan, and South Dakota are working with internal action teams or individual directors and managers of SMT and categorical programs or both, as well as, external evaluators and advisors to:

- establish clear communications at every level around the alignment of curricula, instruction, assessment, professional development, teacher certification, school accreditation, equity, and needs of children and families.
- understand how the structure and mission of units and programs in the SEA furthers or impedes infusing equity and excellence throughout the SEA. Part of this process is driven by the Goals 2000: Educate America Act which provides a broad framework for reform, including increasing high school graduation requirements (particularly in mathematics and science), instituting statewide testing programs that include multiple assessment strategies, offering more Advanced Placement (AP) Courses, promoting the use of technology in the classroom, and instituting new teacher evaluation programs.

- encourage cross-program development between office units with responsibilities for content or categorical programs, particularly in the area of professional development. For example, utilizing a mini-grant from the National Governors Association, Michigan has been working on a coordinated teacher professional development initiative.
- encourage risk taking by SEA program managers, including encouraging staff in SEAs to interpret legislative guidelines as broadly as possible in order to achieve equity.
- set up review meetings, discussions, and focus groups around issue papers and reports so as to create an on-going learning environment in the SEA in terms of SMT equity and excellence.

These collaborations and partnerships for SMT education reform for all have included the development of the following products:

- **equity guidelines or standards or toolkits**. In *State Curriculum Frameworks in Mathematics and Science*, 1995, Blank and Pechman found that most SMT state frameworks consistently lack local strategies that promote equity, and states are producing guidelines, standards, or toolkits that focus on promoting and improving equity, school and classroom climate, curriculum, assessment, professional development, management and governance, community outreach, and access to technology. Equity guidelines are based on benchmarks identified by a NSF Statewide Systemic Initiatives Taskforce (see Table 5).
- **equity checklists** that help both SEAs, LEAs, and schools assess educational equity strategies that are currently in place. The resulting information can guide future efforts, directions, and strategies for achieving equity and excellence in systemic reform. Samples of equity checklists and tools produced by Florida and South Dakota are included in Appendices I and II.
- **reports by external evaluators** on existing and needed resources for reform. Examples of reports include studies on state technology resources and studies on the supply of minority teachers.
- **identification of state-based SMT equity programs that can be widely disseminated**. Examples include the Sinte Gleska University/ Native American Mathematics and Science Educational Leadership Program in South Dakota and the Promise Project in Florida which focusses on Spanish and Haitian Creole students.
- **SEA-based equity collaborations and associations that scale up reform**. For example, the SEA in Michigan, in collaboration with Western Michigan University and the National Association for Black School Educators (NABSE), is building a SMT leadership development institute for superintendents in districts that have large percentages of students who are performing poorly in science and mathematics. The South Dakota SEA has developed teacher professional development and community-based outreach collaborations with both Girls Inc. and the AAAS Science Linkages in the Community (SLIC) Office in Rapid City, South Dakota.

As SEAs continue their work with SMT equity and excellence, they are challenged by equity issues related to:

- **teacher professional development programs**. While it is understood that most teachers need to acquire more extensive knowledge related to mathematics and science content/pedagogy as they relate to multiple assessment strategies (including authentic or portfolio-based assessments), it is not yet widely realized that professional development for teachers must also be coupled with equity training. At present, SEAs and school districts offer equity training and SMT content/pedagogy/assessment training for teachers as separate programs. Consequently, science and mathematics administrators and teacher leaders are rarely involved in equity or diversity training workshops that are related to SMT content. However, much can be learned about effective teaching and learning from diversity models that are used in equity-based and U.S. Department of Education categorical programs. In contrast, Title I, bilingual and LEP, special education administrators, and lead teachers are usually involved in training programs related to diversity issues that are, for the most part, devoid of SMT content or that focus on remediation rather than high standards for all students. In the CCSSO report, *Systemic Reform and Limited English*

TABLE 5.

STATEMENT ON EQUITY IN MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION POLICY

These components and benchmarks include:

School, State, District Policies

- Policies ensure that teachers and administrators value diversity. School districts have policies that address issues of equity.
- State and district policies encourage that teachers and school administrators reflect the diversity of the student population.
- Resources have been reallocated to address equity concerns.

Partnerships and Community Outreach to Parents and Business

- Community outreach activities provide opportunities to discuss values related to equity. All community members are included in the dialogue.
- Community outreach activities strive to empower parents to be engaged in their children's education.
- Parents are active supporters of activities which address issues of equality. Community partnerships include leadership from all facets of the community. Alliances between people of different backgrounds are fostered. Collaborative and coalitions are formed with industry partners that include minority-owned businesses.

Public Awareness and Education

- Parents of children in traditionally underrepresented groups participate as leaders in SSI activities.
- All public documents and images are free of stereotyping and are representative of the diverse population of the state.
- Efforts are in place to increase awareness of inequities and the need to address them.

Curriculum, Instructional Materials, Frameworks

- Curriculum materials are selected to ensure that they are free of bias, represent all groups and encourage participation.
- Equity is addressed as an integral component of the curriculum framework. The curriculum is compatible with teaching and learning strategies for supporting learning for all students. All students have access to high quality instructional resources (including books, science and mathematics materials and manipulatives, calculators, and computers).

Professional Development

- Teachers, who are themselves members of underrepresented groups, participate in professional development programs.
- All teachers whose classes include members of traditionally underrepresented groups participate in professional development programs.
- All teachers are prepared and supported to teach in diverse populations of students. Leadership development programs include participants from all segments of the population.
- Professional development activities address equity and diversity in the K–12 classroom.

Assessment

- Methods of student assessment are sensitive to diverse student populations. Student assessments are aligned with teaching strategies and instructional materials which are sensitive to diverse student populations.

TABLE 5. (CONTINUED)

Administration

- Administrators are active supporters of activities which address issues of equity.

Access to Technology

- All students have access to technology education and equipment.

School Structure, Classroom Practice

- Teachers use teaching strategies appropriate for students in diverse classrooms and are sensitive to the cultural differences and perspectives of diverse populations. Teachers and students have personal interactions which reflect mutual respect. All school activities are geared toward greater inclusiveness.

Student Performance Measures

- Measures demonstrate a significant increase in the rate of achievement of traditionally underrepresented students in mathematics and science.
- Student assessments and tests are based on the new mathematics and science standards. Assessment instruments are free of bias.
- Baseline data for student achievement is collected.

Management of the SSI

- Clear, specific statements supporting equity and diversity are integral to policies of the SSIs.
- Project staff, advisors, committees and participants represent the diverse population of the state.
- All grants have criteria which address issues of equity.
- The SSI has representation on the SSI Equity Action Group.
- All components of the SSIs are concerned with inclusive practices.
- Moneys and other resources are targeted to addressing equity issues.

Source: The Equity Action Group of the National Science Foundation Statewide Systemic Initiative.

Proficient Students (1995), the two most important strategies identified for enhancing the learning of LEP students are equipping mainstream teachers with knowledge about the second language acquisition process and strengthening the content knowledge of all teachers who work with LEP students.

- **classroom implementation of SMT curricula, instruction, assessment, and equity**. Systemic reformers are concerned about the quality of SMT curricula, instruction, and assessment at the classroom level. Although SEAs and LEAs are scaling-up teacher development programs, it is expected that implementation at the classroom level, in the near future, will be uneven for a variety of reasons. These reasons include differences in teacher background, perception, and attitudes and behaviors towards each child, as well as the amount and quality of in-classroom technical assistance provided to teachers.
- **ability grouping**. Although ability grouping is a school or school district-based decision, the use of ability grouping in mathematics and science is declining. Ability grouping is more common in high schools than in middle or junior high schools and more common in mathematics than in science (Weiss, 1994). In particular, educators are concerned about the impact of detracking on gifted

BEST COPY AVAILABLE

and talented students and how the inclusion of children with disabilities is affecting all children in the classroom.

- **the slow pace of implementation of high standards mathematics and science in high poverty school districts and schools**. Although the Improving America Schools Act of 1995 (the reauthorization of the U.S. Department of Education categorical programs for educationally disadvantaged children) called for standards-based mathematics, many schools that receive these funds are moving slowly towards implementation of high level mathematics. In addition, since science standards were not included in the legislative language, less attention is being paid to standards-based science.

  In Florida, to facilitate student entry into high level SMT courses, the Office of Multicultural Student Language Education reviews course and program participation data for all school districts. If certain courses and programs do not have a diverse student population, the staff will work with the school district to determine if and where there is a problem and will suggest strategies to improve diversity in classes and programs.

  At the national level, in an effort to jump-start the movement toward high standards in mathematics and science, organizations such as the Education Trust in Washington, DC, and the CCSSO are providing technical assistance to states and districts (Education Trust, 1996).

- **school districts and schools with low assessment scores**. States or districts or both usually provide technical assistance teams for school districts and schools with low assessment scores. In some cases, states (including Michigan and New Jersey) are taking over the operations of school districts and schools that have not been able to improve assessment scores within a given period of time. As indicated in the Michigan case study, although 93 schools did not meet state accreditation at the end of 1994-1995, only 39 did not meet accreditation at the end of 1995-1996. State administrators believe this result occurred within one year's time, primarily because the schools had been working steadily toward school improvement.

- **increasing the inclusion of LEP and special education students in assessment**. State and national assessment staff are concerned about enhancing the overall participation of LEP and special education students in assessments. In many cases, state and local policies provide for exclusions of these students based on staff recommendations, lack of test adaptations, or lack of accommodations, or some combination of these factors. Although concerns exist about comparing the assessment results of those students for whom accommodations and adaptations have been made with those of other students, the National Assessment for Educational Progress (NAEP) has identified ways to increase the inclusion rate of LEP and special education students in assessments, particularly in mathematics:

  students with disabilities include large print booklets, large face calculators, braille booklets, and talking calculators. Examples of accommodations for administering tests include allowing unlimited test time, having individual or small group administrations, the use of facilitators who read directions, the use of oral examinations, and other accommodations.

  LEP students include using Spanish-English bilingual assessment booklets (with text in Spanish presented on one side of the booklet and text in English presented on facing pages) and using Spanish-only assessment booklets.

  NAEP further recommends that all students should be assessed, if school staff determine that students are capable. In cases of staff uncertainty, the school should err on the side of inclusion.

  Examples of accommodations and adaptations for assessment of LEP students and for students with disabilities provided by Florida, Michigan, and South Dakota are outlined in their case studies.

- **rural communities**. Issues related to rural communities include (1) motivating parents to push for higher education for their children and (2) getting families and elders in isolated rural communities—including farmers and Native

Americans and migrant workers—to understand how SMT can improve the way they and their children live and work. Discussion of this concept is particularly important in those communities where technology will dramatically shift the services and employment opportunities.

- **early childhood education**. As indicated in *Years of Promise* (Carnegie Corporation of New York, 1996), children make developmental leaps that form the basis of later achievement. Because of this fact, more attention needs to be given to expanding and developing high quality education programs for children ages three to five, including age-appropriate activities that build science and mathematics skills. As federal and state agencies restructure welfare support for children and families, educators wonder how these changes will affect the National Education Goal related to readiness.

  Recognizing the need to build science and mathematics skills at the preschool level, the South Dakota Office of Comprehensive Services, in partnership with the South Dakota Headstart Association, is seeking foundation funding for a proposal related to strengthening science and mathematics in preschool programs.
- **linking external SMT access programs and community-based organizations for girls, minorities, disabled, and economically disadvantaged students to school reform**. Most equity advocates who develop and operate model SMT access programs or community-based organizations appear to be marginally involved in state, district, and school-based SMT systemic reform. Although in most states a few key equity advocates are called upon to serve on SMT equity taskforces, no state has long-range deliberate plans to help staff in SMT access programs and community-based organizations to better understand and become more involved in all aspects of SMT systemic reform. Increased understanding and involvement by these groups, as subcontractors or consultants to SEAs, can add new perspectives on how to motivate and engage girls, minorities, disabled, and economically disadvantaged children and their families in both in-school and out-of-school SMT activities.

  For example, lessons on how to align curricula, instruction, assessment, and equity can be learned from out-of-school SMT student access programs. Since the early 1970s, SMT access programs have identified and worked with educationally or economically disadvantaged junior high and high school students or both to increase their participation, retention, and graduation rates in higher education SMT programs (Matyas and Malcom, 1991 and Malcom, George, Van Horne, 1996). Community-based organizations, for example, often provide youth development support services (including SMT activities) during non-school hours for families in low-income communities (Carnegie Corporation Task Force, 1992).
- **getting both SEA managers and equity advocates to understand the difference between special projects and infusing equity into systemic reform.** Rather than deciding on appropriate strategies to meet the needs of each school or student, many educators and equity advocates think that model equity programs alone are the way to solve equity problems. This one-size-fits-all approach does not take into account the complexity of the system or the heterogeneity of the student population nor the increasing number of those students to be served.
- **designing an overall data management system that shows how SEAs are meeting the needs of all students**. SEAs are still grappling with how to design an annual evaluation system that shows how well they and their LEAs and schools are doing in terms of infusing equity and excellence into SMT systemic reform. Many SEAs disaggregate their data by race and gender. However, many do not disaggregate their data by gender within race/ethnic categories. In addition, most states use the format developed by the National Education Goals Panel to determine if the United States is building a world class education system.

  As a diagnostic tool for school improvement, the CCSSO State Collaborative on Assessment and Student Standards (SCASS) Science Project, a 10-state collaborative, has been developing a guide for K-12 educators on the use of surveys and data regarding science content, classroom practices, and

student achievement. This guide will help inform instruction in science (Martin, Blank, and Smithson, 1996). Analysis of the enacted curriculum make it possible to compare the kinds of curriculum, instruction, and assessment practices and teacher experience and professional development in resource-poor communities to those of resource-rich communities. CCSSO views the SCASS assessment as a diagnostic tool, not an accountability mechanism nor as a rigid measure of quality control.

The case studies in this report contain a more detailed look at how SEAs in Florida, Michigan, and South Dakota are infusing equity and excellence into policies, practices, and programs, particularly as related to SMT.

II. Recommendations to SEAs for Infusing Equity into SMT Systemic Reform Initiatives

1. Staff in SEAs should conduct a comprehensive study of how SMT equity can be infused into both their overall school improvement plan and their NSF plan (if they have NSF funds). This plan should be seen as an initial plan and should be reviewed and revised annually by SEA staff with an eye towards documenting progress and unintended results.
2. For the initial study an internal action team should be formed and include staff from offices responsible for SMT, categorical, PreK, communications, assessment/information systems, legislative affairs, and other appropriate offices.
3. Since equity is a cross-cutting variable, plans should include an assessment and review of existing SMT and equity policies, programs, and practices. The internal action team should focus on coordinating these elements in order to achieve the greatest degree of reform as related to SMT. This team should:
   - review and suggest strategies for coordination of SMT Programs, U.S. Department of Education categorical programs, and preschool/early childhood efforts funded by the state and other federal agencies, and any other appropriate internal and external equity initiatives supported by business or private sources.
   - review the organizational structure of the SEA and suggest procedures for continuous input and interaction among all staff, as well as all external advisors.
   - suggest ways of including findings in school improvement plans and NSF plans (where appropriate).

The review should pay close attention to the:

- implementation of standards-based mathematics and science curricula, instruction, and assessment in high-poverty schools and for children in special education, LEP, and early childhood programs.
- development of a management information system that presents concise and coherent data and evidence that help policy makers and external evaluators to easily determine the performance of low-resource schools compared to high-resource schools. Evidence should also include information on special education, isolated rural, limited English proficient students, and teacher preparation, including Pre-K.
- school financing, including the production of case studies or vignettes on how schools or districts can effectively use their resources in order to affect SMT reform.
- alignment of equity training to curriculum, instruction, and assessment. While an appropriate first step may include school climate and conflict-resolution workshops, the next step needs to take into account how equity is going to become an integral part of overall SMT professional development. Implementing this step could require that a joint professional development training program between SMT and categorical program staff, as well as other SEA managers involved in teacher professional development be created.
- ways to increase the participation rate of limited English proficient and special education students in assessment.
- technology initiatives that focus on access, design, and equity. It is important to understand how diverse groups perceive, relate to, and engage with technology.
- inclusion of equity responsibilities in all job descriptions and performance appraisals. In the absence of accountability for equity, staff who do not have primary responsibility for equity tend not to focus on it.

- development of a communications plan that pays attention to perceptions and attitudes of citizens in low-resource areas, including addressing parental push for higher education and improving the quality of life for low-resource communities (as related to health care, the environment, and better paying jobs).
- deliberate involvement of SMT access programs, community-based organizations, and state and regional government staff who provide human services in SMT systemic reform. The plan should include an assessment of all programs and activities these groups are already conducting, not just those related to SMT. Findings from the assessment should be mapped against all the components of systemic reform to determine appropriate activities that can be easily integrated into existing programs and missions. In some cases, this task may include subcontracting with external equity-based organizations for services.
- In addition, attention needs to be paid to utilizing resources from Health and Human Services, the U.S. Department of Housing and Urban Development, and the U.S. Justice Department, particularly in regards to Headstart, EvenStart and out-of-school education programs run by these agencies.
- on-going small-scale research initiatives that inform action. For example, studies related to (1) university-based SMT access programs to determine lessons learned about SMT equity and excellence that are transferable to PreK-12 school settings; (2) how early childhood curricula impact later achievement; and (3) how families in high poverty areas and rural communities perceive technology.

III. Conclusions

As SEAs participating in the NSF systemic reforms and others move forward with changing their policies, practices, and approaches so that the benefits of the SMT education reform will accrue to all students, they have to deal with the day-to-day realities of implementing reform. These realities include:

- sustaining the SMT reform after NSF and other discretionary funds are gone, particularly in high-poverty and isolated rural areas. SEAs in both Florida and South Dakota are no longer receiving NSF funds and both have restructured their SEAs and are using U.S. Department of Education Funds to continue SMT reform.
- creating an organizational culture in which equity in SMT is not marginalized, where special projects are used appropriately, and where all managers examine every policy, plan, and program for equity implications for each student.
- developing effective SMT public engagement campaigns (including connections to community-based organizations) that can change the attitudes and perceptions of resistant school board members, administrators, teachers, parents, and business and community leaders.

CASE STUDY: FLORIDA
A Look at How Florida Is Infusing Equity and Excellence into Systemic Reform

Context

Florida is experiencing unprecedented growth, with a projected doubling of the population between 1972 and the year 2000, making Florida the fourth most populated state. Nearly 27 percent of the population is minority, almost equally divided between Hispanic and African American. Each year, the state absorbs approximately 60,000 new students into the educational system, with a K-12 classroom teacher attrition rate of nearly 6 percent. Tourism plays a significant role in Florida's economy, as do the high-tech space and defense industries in certain regions of the state. By the year 2000, 83 percent of new entrants into the work force will be women, minorities, and immigrants—groups traditionally underrepresented in scientific and technical fields.

Vision

Florida's SEA vision celebrates diversity and focuses on empowering individuals to pursue and support life-long science, mathematics, and technology learning.

Frameworks/Guidelines/Standards

The State Board of Education approved the *Sunshine State Standards* on May 29, 1996. The *Sunshine State Standards* identify the essential knowledge and skills that students should learn and for which the state will hold schools accountable. Simply put, the *Standards* are what the SEA expects students to know at certain stages of their school career. Standards in language arts, mathematics, science, social studies, music, visual arts, theatre, dance, health, physical education, and foreign languages have been developed. Each subject is broken down into four levels: PreK-2, 3-5, 6-8, and 9-12. Curriculum frameworks for each of the above subjects have been developed as well. In fact, the *Standards* are included within each subject matter framework as Chapter Three. According to the *Sunshine State Standards* homepage on the Internet, every school and school district in Florida has a set of these materials, known as the *Florida Curriculum Framework: PreK-12 Sunshine State Standards and Instructional Practices* series. In addition, speakers of languages other than English can call a toll-free hotline to obtain information on the *Standards* in Spanish or Haitian-Creole.

An electronic curriculum planning tool is available on the Internet to help districts, schools and teachers develop teaching and assessing activities for the *Standards*. Training began in the summer of 1996 to develop a cadre of trainers to assist districts in implementing the standards. The SEA plans for districts and schools to align local curriculum with the new standards, developing learning and assessment activities and pilot testing them during the 1996-97 school year. After the statewide field test in 1996-97, revisions, if necessary, will be made to the standards. To quote the document itself, "nevertheless, how the standards are organized within a specific curriculum, how they are taught within learning activities, what instructional strategies and materials are used to teach them, how much time is spent teaching them, and when they are taught within the developmental levels are local decisions."

Statewide Student Assessment

LEAs select their own norm-referenced tests; data from such tests are sent to the Department of Education for compilation at grades four and eight. A new statewide assessment test, the Florida Comprehensive Assessment Test (FCAT), is being developed to measure students' achievement of the new *Sunshine State Standards* and will be administered for the first time in the spring of 1998. In terms of assessment the state's equity strategy is as follows: disaggregate data by race, ethnicity, gender, and economic levels; and align assessment measures with the new *Sunshine State Standards*.

Worth mentioning is the student achievement data coming from Dade County, the fourth largest school district in the nation, which consist of a majority minority population. In data reported in the *Westat*McKenzie Consortium Systemic Initiatives Newsletter*, median scores for Dade County students on the Mathematics Applications subtest of the Stanford Achievement Test in grades 1 through 5 are at or above the national median percentile. A noticeable increase in elementary student mathematics achievement—up to 11 median percentile points—has occurred for the past three consecutive years for African American, Hispanic, and all students.

LEP students may be exempt from state assessments and from standardized, norm-referenced tests when they have been in a program designed to meet their needs for less than two years. School districts report data to the state; the state, in turn, develops a yearly report on the progress of LEP students. There are no assessments in languages other than English. However, LEP students may be given additional time as necessary to complete the test; they may be given access to an English-to-heritage language or heritage language-to-English dictionary; they may be given an opportunity to be tested in a separate room.

Scores for deaf, hard of hearing, specific learning disabled, physically impaired, emotionally handicapped, and educable mentally handicapped students are not included in any classroom, school, district, region, or state averages. These students, however, are offered special testing modifications such as a flexible setting, flexible scheduling, recording of answers, mechanical aids, revised format, and auditory or sign language presentations.

Course Taking/Ability Grouping/School-to-Work

In order to receive a high school diploma, a student needs to take three math courses and three science courses. In terms of math, any three courses in the course directory for math (e.g., General Math; Calculus; Analytic Geometry; Consumer Math; Math Skills; Applied Math I, II, and III; Exploring Math I, II, III; and Business Math, etc.) will meet the graduate requirement. With respect to science, any three credits, two of which must be through the laboratory component, will meet the graduation requirement. The state is considering that there be a unit in Algebra or higher for graduation.

Commissioner Brogan sought passage of a law increasing high school graduation requirements. The bill, which was vetoed by the governor due to the attachment of a prayer bill, proposed increasing the required grade point average from a 1.5 (D-plus average) to a 2.0 (C average), limiting the number of basic courses that can apply toward graduation, and requiring Algebra I as a condition for graduation. The State Board of Education approved a resolution requesting all school districts in Florida to voluntarily adopt the higher graduation standards. Currently, school boards in more than 25 districts have approved the higher graduation standards for their students. Of note, Florida has a counseling-for-future-education document that is circulated by the University system to all schools. This document lists the high school courses required if a student is to attend a university.

It is up to LEAs to determine how and if ability grouping will be used. In brief, ability grouping involves the degree of rigorousness in course work. For example, students are tracked by the level of a course they are taking—Fundamental Biology, Biology I, or AP Biology. Indirectly, in gifted education, ability grouping is supported. Gifted students can only be serviced with certified gifted teachers and other gifted students. In special education programs, there is more of a move towards inclusion; they are moving towards this same model for the gifted programs. Lastly, the SEA is piloting a new funding and statewide student profiling system based on the level of need and not the exceptionality nor the disability.

In reference to school-to-work programs, the SEA receives federal funds from the U.S. Department of Education. The SEA, in turn, disperses the funds to the LEAs and provides them with technical assistance and site visits. Divided into 28 regions, encompassing all of the 67 school districts, each region is centered around a community college. School-to-work funds are distributed to these 28 regions, so the region can work on a local level with individuals in education and business to develop whatever is necessary to ensure that every child in that area graduates with work-ready skills.

With respect to science and school-to-work, the science curriculum will eventually reflect what kids need to know in the real world. Bell South, for example, realized that they have a number of employees who are

on the verge of retirement. Worried about finding suitable replacement employees, Bell South joined with the National School to Work Program.

The State of Florida is working on the Bell South science curriculum. Teachers and scientists are working together in Seminole County on the middle school science curriculum and lesson plans. Essentially, lesson plans are being developed from the requirements in the *Sunshine State Standards*. Bell South retirees, as well as current Bell South employees, have volunteered to teach the lessons being developed in Seminole County schools. The goal is to ensure that what students learn in science class is relevant to the "real" world, thus linking science and math studies to employable skills.

School Financing/Resources

The state uses a formula based upon school enrollment. Programs are weighted according to grade level and type (e.g., gifted, vocational, etc.). According to the 1995 edition of the Council of Chief State School Officers' *State Indicators of Science and Mathematics Education*, average current expenditures are $5,356 per pupil. Florida uses its GOALS 2000 funding for local reform education grants, preservice/inservice staff development, and grants for schools with critically low performance.

In terms of technology resources, Florida was one of the first states to implement a statewide computer information network for schools and school districts; it has one of the nations highest levels of technology equipment available for use in schools. As reported in a March 1995 *Statistical Brief* distributed by the State of Florida Department of Education, Florida public schools have reported a total of 278,676 microcomputers being used for student instruction and 46,803 being used for administration during the 1994-95 school year. According to the head of the state's technology system, every school has a computer and each school is connected to the state's network system.

Statewide Systemic Initiative/SERA

Florida's statewide systemic initiative (SSI) ended on June 30, 1996. Mid-way through their SSI program, the state began to focus on equity as an issue, developing an equity action plan with goals and timetables as well as establishing partnerships—with the PTA, Newspapers in Education Association—encouraging parent/family involvement, and reaching out to minority and low-income communities to encourage increased participation in science and math activities at the district and school levels. The focus was as follows:

- restructuring K-12 science and mathematics education;
- restructuring the preparation and enhancement of science and mathematics teachers to support SSI changes at the elementary and secondary school levels; and
- developing community support for systemic change.

A team of co-principal investigators and a State Science and Mathematics Advisory Committee guided the efforts at the state level. With past NSF funding, the SEA established a network of 36 model schools in 27 demographically representative school districts. From these 36 schools, 10 Discover Schools were identified. In short, the Discover Schools were pilots. They served as a source of information, and model, for others interested in successful science and mathematics education reforms and programs. A goal of these schools, and the capacity building effort, was the establishment of a system of professional development that implemented the goals and standards of the state's system of school improvement and accountability—Blueprint 2000.

Although Florida's SSI has ended, several Department of Education staff will continue to work with AAAS on the SERA project with respect to staff development. Their goal is to infuse equity within the different training programs to assist teachers in implementing the state's new *Sunshine State Standards*. The District level will continue to work with SERA on their equity task forces in 1996-1997.

Key individuals who were involved in the NSF systemic reform efforts are now involved in a new SEA regional technical assistance structure called Area Centers for Educational Enhancement which is funded by Goals 2000 and Eisenhower funds. Some of the services the Centers will provide are as follows:

- provide professional development opportunities for educators in curriculum, instruction, and assessment;
- provide technical assistance to schools with critically low student performance;

- serve as a clearinghouse for exemplary mathematics and science programs among universities, community colleges, schools and school districts.

Urban Systemic Initiative

According to the *Westat•McKenzie Consortium Systemic Initiative Newsletter,* the Dade County Urban Systemic Initiative (USI) has affected the schools, teachers, students, and families of Dade County. To maintain a constant focus on the importance of science and mathematics education, the school district has changed its policies in the following ways:

- All students must successfully complete Algebra by grade 9.
- A new standards-based curriculum in elementary mathematics will be implemented.
- More than 3,000 teachers will be involved in professional development experiences.
- A phased-in, kit-based elementary science program will be implemented.
- Basic-level mathematics and science courses will have been eliminated, and the use of test scores and other barriers to higher level courses will not be permitted.
- The textbook adoption process will be focused on a limited number of high-quality, standards-based selections.

Policies that Foster Equity/Inclusion

Within the Florida Department of Education there is an Equal Educational Opportunity Program (EEOP). This program is charged with maintaining all civil rights issues as well as maintaining the Florida System of School Improvement and Accountability, which is the state's school improvement legislature. (In short, this legislature sets up school advisory committees and charges the schools with responsibilities, e.g., meeting the state's new standards). Its mission is to provide all members of the education community in the State of Florida with assistance in attaining equity in education and to provide an educational environment free of discrimination.

As noted on the EEOP web page, the EEOP provides services to Florida schools, school districts, community colleges, universities, parents, students, and community groups on a wide range of topics that affect educational equity on the basis of race, gender, national origin, disability, age, and marital status. Services include

- consulting on policies, procedures, and practices for civil rights compliance and equity in education;
- training and technical assistance on civil rights and equity in education; and
- providing products, publications, resource lists, and newsletters on equity issues.

Special State-Based Equity Programs

Promise Project. Another example of a program that fosters equity is a program entitled "Promoting Science Literacy for All, Including Culturally and Linguistically Diverse Students," also known as the *Promise Project.* The Promise Project is directed by Sandra H. Fradd, Project Principal Investigator (PI), and Okhee Lee and Frank X. Sutman, as Project Co-PIs. Both the *Benchmarks* and the *National Science Education Standards* say science is for all. To quote Okhee Lee, "The documents [the *Standards* and the *Benchmarks*] emphasize science for all, and the Promise Project is an attempt to make the promise real! " Accordingly, the Promise Project is using both of these documents as a framework for science literacy.

Funded by NSF, the Promise Project is in its second year of a three-year effort. Working with teachers and fourth grade students of three language groups—Spanish, Haitian Creole, and English (i.e., English language-dominant students)—the Project's staff are simultaneously examining science learning and language development. A critical component involves the participation of teachers who share the same language and cultural backgrounds of their students. While gaining a better understanding of science, these teachers will provide insights into teaching science to be relevant and meaningful to the students.

Some of the students in the Promise Project are learning English as a new language. Fourth grade is very critical in terms of both language development and science learning. By the fourth grade level, students are supposed to have developed basic literacy skills in reading and writing. They are expected to start developing advanced skills of abstractions, putting ideas in sense-making, using language beyond the reading and writing of simple texts, and learning academic language in content areas. If the students have not developed their

literacy skills by the fourth grade, it will become increasingly more difficult for the students to develop such skills at a later date. Also, in terms of science education, fourth grade is where science learning involves more abstract concepts and more developed thinking.

The Promise Project works with students and teachers in classroom settings collecting data—via questionnaires, clinical interviews with students and teachers, classroom observations, and various types of analysis frameworks—that examine aspects of science and language development. Cognitive strategy use and interactional (oral discourse, written samples, graphs/drawings, mean length of turn (MLT), discourse patterns) are also key aspects of analysis frameworks. The SEAs and LEAs, especially the Dade County district, are examining these issues as well. To be frank, the line between the issues of language and special education is very tenuous at best. By working with teachers who share the same language and cultural backgrounds of their students, the Promise Project expects to find ways to teach science effectively with students from diverse backgrounds.

The Promise Project had ties with the state's now defunct SSI. Members from both initiatives are on the project's advisory board. Articles and findings are shared. Dr. Lee has been presenting project findings at state meetings as well as at Dade County USI workshops for teacher training. Hence, results have been disseminated at both the district and state levels.

Family Math and Family Science activities. A form of community involvement, these activities are workshops conducted with teams of people such as teachers and parents. These sessions give the attendees an opportunity to learn math/science activities as well as meet teachers, students, and other members of the community.

McKnight Program. Another example of an equity program is the McKnight Program. Funded by the Florida Endowment—the State of Florida donates $1 for every $2 from McKnight—the McKnight Doctoral Fellowship Program awards as many as 25 fellowships each year. Such fellowships must be used at one of the 11 participating Florida universities.

Teacher Licensing/Training/Professional Development

Teachers of science and mathematics are not required to have majored in these subjects. However, teacher assessment is required for certification. To clarify, teachers undergo a written test, turn in a portfolio, and have their classrooms observed. In terms of professional development requirements for renewal of certification, Florida requires six semester credits in a field which promotes, enhances, or supports the service the teacher provides, every five years. Proportionally fewer minorities are entering and completing teacher education programs than are currently enrolled in Florida's public schools or teaching in its classrooms.

With respect to LEP students, according to a Spring 1995, Council of Chief State School Officers' report, teachers responsible for the English language arts instruction must have an ESOL endorsement. Schools of Education are beginning to add courses that lead to an ESOL endorsement as part of their program to train elementary school teachers. A Consent Decree explicitly delineates training responsibilities for English teachers, basic subject area teachers, and all other instructional personnel. Inservice materials have been developed to meet the Consent Decree requirements. Professional development activities are both subject-matter-based and school-based; they are organized at the district and school level.

The Council of Chief State School Officers' report noted the following professional development needs:

- need for timely training,
- alternative materials that facilitate language learning and content adaptation, and
- resources to enhance the use of technology in the classroom.

A very encouraging statistic is the number of teacher education graduates in 1993-94. According to *Trends in the Supply of New Teachers in Florida*, African Americans represented 10 percent of the total teacher education graduates in 1993-94; the number of Hispanics in education have been increasing as well. However, despite these increases, the proportion of African Americans entering education is only about two-thirds the proportion of Blacks in the current teacher workforce. In addition, the percentage of African American teachers entering the school system is only

BEST COPY AVAILABLE

slightly more than a third of the percentage of public school students who are Black. Moreover, due to the tremendous influx of Hispanic students into the Florida public school system, the ratio between Hispanic students and Hispanic teachers has remained more than three times the ratio between white non-Hispanic teachers and white non-Hispanic students.

Early Childhood Education

The office of Early Intervention and School Readiness has several programs. Each program has an integrated curriculum; hence, there is not a specific focus on science or math but rather a focus on an entire curriculum whereby all of the disciplines are taught. For example, children might work with blocks to learn about counting; children might examine a birds nest or perhaps discuss the seasons. The state's frameworks are broken down by clusters, and PreK-2 is one of the clusters. The goal is for the student to know the concepts identified in the PreK-2 cluster by the second grade.

Some examples of PreK programs follow. The Florida First Start Program provides early family intervention to at-risk infants and toddlers and their families. The PreK Early Intervention Program provides education intervention to at-risk preschoolers. The Even Start Family Literacy Program (part of Title I) provides a broad range of services to promote child and adult literacy through the collaboration of service providers. The PreK Program for Children with Disabilities (for children aged three through five) and the Infants and Toddlers with Disabilities Program make funds available to families who have children with disabilities so these children can have a free and appropriate public education. Lastly, Head Start Cooperative Funding/Collaborative Partnership Incentives were initiated in 1991 to improve the quality of Head Start programs and provide equity in programs serving similar populations of children. In 1993 these initiatives were expanded to include other providers of services to young children and their families, including subsidized child care and private child care.

Title I Programs

Florida's Title I accountability model calls for reading, math, and writing. There is not a focus on science in Title I at this time. Many Florida school districts have remedial math programs as well as some developmental math programs; very few have math enrichment programs.

Gifted Programs/Special Education

Florida has a strategic plan and mission for exceptional student education. What is an exceptional student? An exceptional student is a student who is an educable mentally handicapped, trainable handicapped, or physically handicapped individual; or a speech-, visual-, language-, hearing-, etc., impaired individual; or a part-time, homebound, or gifted individual; or some combination of these characteristics. In short, *exceptional* covers a wide territory. The mission of exceptional student education in Florida—which is committed to the development of the unique gifts of each exceptional person—is to ensure the achievement of each and every individual's extraordinary purpose by expanding opportunities through the collaboration of families, professionals, and communities.

Gifted programs are considered to be special education programs in Florida. A Department of Education official explained that individual education plans (IEPs) are developed for gifted students as well as for special needs students. Curricular focuses are guided by a student's individual characteristics. A district may decide to focus on a given content area; however, that decision is made by the district itself. To quote from the SEA's equity action plan, "the primary goal is to effect change in student participation and performance so that all students have equitable access to high-quality science, mathematics, and technology education, and to equitable treatment in the classroom, schools, and postsecondary education institutions. The result of which is to reduce the academic performance gap between mainstream students and underrepresented students, and to raise the level of knowledge and skills in mathematics and science for all students."

Gifted students are considered to be special education students. Hence, the following objectives of the strategic plan for exceptional student education applies to gifted students as well.

- 100 percent of all students with exceptionalities will graduate.
- 100 percent of exceptional students will achieve 100 percent of their personal goals.

- Within three months of graduation, 100 percent of all individuals with exceptionalities, will by choice be employed, enrolled in postsecondary education, participating in an agency training or development program, or receiving agency services, or involved in a combination of these activities.
- All individuals with exceptionalities will successfully achieve full inclusion within their community.
- The expectations and individual successes of Florida's individuals with exceptionalities will set the standards for every other state in the nation.

One of the goals of the SEA is to disseminate information on model programs designed to meet the needs of minority students and special student populations such as LEP, Migratory, and Title I students.

The SEA provides technical assistance to LEAs and schools to assist in the compliance of requirements under Title VI for LEP students.

The Florida Network. This group receives funding from the Florida Department of Education to provide adolescents and adults who have special needs every opportunity to reach their maximum potential as contributing members of society. The Network's mission is met by supporting the expansion of choices offered to adolescents and adults with special needs which is achieved by assisting districts, consumers, businesses, and organizations to coordinate their services and disseminate information concerning promising practices.

Bilingual Education

Florida's Office of Multicultural Student Language Education does not specifically target science or mathematics. Instead, they focus on all of the disciplines and strive to ensure equal access for all. In order to do so, department staff review course and program participation data for all school districts. If a certain school district is deemed a statistical deviant (i.e., certain programs do not appear to have a diverse student body), the staff will work with the aforementioned school district to determine if and where there is a problem as well as how to correct that problem.

FLORIDA

Background Characteristics	
Number of public high school graduates, 1993-94 (1996)	88,032
Percent of all 19-20 year olds with a high school credential (1990)	79
Percent of all 23-24 years olds with a high school credential (1990)	82
Number of Pre K-12 Students in Public Schools (1996)	2,108,968
Revenues for public elementary and secondary education, Pre K-12,1994 (1996)	$11,927,112
Expenditure per pupil (1996)	$5,415
Per Capita Income (1990)	$14,698
Percent of Children in Poverty (1993-94)	26.9
Parents' highest level of education (college/high school), reported by percentage of grade 8 students (1992)	39/24
Percent of Mothers 18-19 Years of Age with Less Than 12 Years of School (1988)	53.4

Sources: U.S. Department of Education, National Center for Education Statistics, compilation of data from *The Condition of Education 1995* and *The Condition of Education 1996* as well as *Digest of Education Statistics 1994* and Council of Chief State School Officers *State Education Indicators, 1993*.

Outcomes: Percentage of Grade 8 Students at or above Basic Mathematics Level by Race/Ethnicity, 1992 NAEP	
White	70
Black	27
Hispanic	40
Asian/Pacific Islander	N/A
American Indian	N/A

Source: Council of Chief State School Officers, *State Indicators of Science and Mathematics Education, 1995*, Washington, DC 1995.

Outcomes: Average Proficiency of 8th Graders in each of the Five Mathematics Content Areas as Measured by the 1992 NAEP Mathematics Report Card for the Nation and the States	
Numbers and Operations	264
Measurement	254
Geometry	255
Data Analysis, Statistics, and Probability	259
Algebra and Functions	260

Source: U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics, 1994*, Washington, DC 1994.

BEST COPY AVAILABLE

Systemic Reform Efforts

There is the view that education reform should be done systemically. How far along is Florida in implementing the following initiatives?

Curriculum guides or frameworks revised to meet NCTM *Standards*	Yes
State developing alternative student assessment in math or science	Yes
Teachers placing heavy emphasis on geometry and algebra, percentage of students	13/47
State releases a public report with district or school level data	Yes
State has defined a set of learning outcomes in math or math incorporated in core interdisciplinary outcomes	Yes

Source: Council of Chief State School Officers. *State Curriculum Frameworks in Mathematics and Science: How are they Changing Across the States?* May, 1995.

Policies and Practices in Mathematics

Percent of math teachers with major in assigned field,* grades 7-12, main assignment/all teachers (1990-91)	48/54
Teacher assessment for certification (1995)	written test, classroom observations, portfolios. Plans for performance assessment
Credits in math required for elementary/middle/ secondary teacher certification in math (1994-95)	NSR/NSR/30
Teachers placing heavy emphasis on numbers/operations and measurement, percentage of students (1993c)	76/15
Teachers placing heavy emphasis on geometry and algebra, percentage of students (1993c)	13/47
Percent of high school students taking key math courses (1993): • algebra • algebra II • calculus	 N/A N/A N/A
Math graduation requirements in Carnegie course units for a regular diploma (1994)	3
Math proficiency/competency test required for high school graduation (1994)	Yes
Grades and type of test scoring (1993-94)	10; 12; Norm-referenced; criterion-referenced

*NSR—No state requirement

Sources: U.S. Department of Education. National Center for Education Statistics, compilation of data from *The Condition of Education 1995* and *The Condition of Education 1996* as well as *Digest of Education Statistics 1994* and Council of Chief State School Officers, *State Education Indicators, 1993* and Council of Chief State School Officers *State Curriculum Frameworks in Mathematics and Science, 1995.*

Note: The Florida State Board of Education approved the *Sunshine State Standards* on May 29, 1996. Also approved and released were the *Florida Curriculum Framework: PreK–12 Sunshine State Standards and Instructional Practices* Series.

31 BEST COPY AVAILABLE

CASE STUDY: MICHIGAN
A Look at How Michigan Is Infusing Equity and Excellence into Systemic Reform

Context

Michigan's economy has long been dominated by the automobile industry. Although Michigan ranks first in the nation in automobile manufacturing, auto employment has fallen from 437,000 in 1978 to approximately 280,000 today. The state has moved to diversify into high-skill, capital-intensive manufacturing. This shift away from dependence on less skilled, assembly-line work is reflected in the passage of major education reform legislation in 1990, which, among other provisions, calls for the establishment of a set of "model core curriculum outcomes" for all students and provides incentive funds for this purpose. In 1993, additional legislation was passed that requires all districts to adopt the state academic core curriculum, including standards for mathematics and science education. According to the 1994 census, Michigan has a total population of 9,496,539: 7,948,976 White; 1,363,726 Black; 57,757 American Indian; 126,080 Asian; and 226,704 Hispanic. Fifty-one-and-a-half percent of the population is female.

Vision

The Michigan SEA is implementing a strategic and comprehensive reform of mathematics and science education for all K-12 students. In an effort to achieve scientific literacy and mathematical power* for all students, the SEA incorporates existing and emergent policy initiatives with the curricular, leadership, and partnership infrastructure to support school-based change in mathematics and science education.

*The National Council of Teachers of Mathematics (NCTM) uses the term *mathematical power* to redefine the mathematical knowledge that all students should know. By mathematical power NCTM means "an individual's abilities to explore, conjecture, and reason logically, as well as the ability to use a variety of mathematical methods effectively to solve non-routine problems."

Frameworks/Guidelines/Standards

Michigan has a revised school code that requires local school districts to develop, adopt, and implement a core academic curriculum. The curriculum includes mathematics and science for all students. The state's goal is for the mathematics and science curriculum frameworks to provide guidance, support, and assistance to schools in planning and developing local curriculum and instructional programs.

The Michigan Department of Education has developed a new curriculum framework. Slated to be available in early 1997, the *Michigan Curriculum Framework* is not just a document. Rather, it is a three tier process—enabling school districts to analyze their current curriculum and instruction practices and, consequently, make improvements and adjustments to their curriculum and instruction practices.

The first tier is an actual document. It covers curriculum standards and benchmarks for mathematics, science, social studies, and English language arts, as well as sections on planning, teaching and learning, assessment, and professional development.

With respect to mathematics and science, the 1997 *Michigan Curriculum Framework* contains updated mathematics content standards and benchmarks. (As of November, 1996, the *Essential Goals and Objectives for Mathematics Education*, 1988, is still in use since pupil assessment in mathematics is based on this material. However, by the year 2000, pupil assessment in mathematics will be based on the 1997 *Michigan Curriculum Framework*.)

The science component of the 1997 *Michigan Curriculum Framework* has not been updated; the science benchmarks and standards are repeated verbatim from the *Essential Goals and Objectives for Science Education* (1991).

Tier two of the *Michigan Curriculum Framework* is composed of documents which are toolkits. For

BEST COPY AVAILABLE

example, one toolkit is a discrepancy analysis toolkit for school districts to use to examine their content and instruction in comparison with the new *Curriculum Framework*. Toolkits on equity analysis, assessment, and professional development are available also. The third tier consists of resources available on the internet and in hardcopy fashion for teachers to use in order to implement the new *Michigan Curriculum Framework* benchmarks and standards as well as clarify the curricula development processes described in the first two tiers.

Statewide Student Assessment

Michigan administers its own statewide tests through the office of the Michigan Education Assessment Program (MEAP). The MEAP is based on *Essential Goals and Objectives* as well as the *Michigan Model Core Curriculum Outcomes*, which were developed in 1991. Testing is conducted in the 4th grade for reading and math; in the 5th grade for writing and science; in the 7th grade for reading and math; in the 8th grade for writing and science; and in the 11th grade for writing, reading, math, and science.

The science tests are designed to measure knowledge in such areas as life sciences, earth and space sciences, and physical science. To achieve a satisfactory score, fifth graders must pass 24 out of 30 objectives, eighth graders must pass 24 out of 31, and eleventh graders must pass 25 out of 32. As of 1996, test scoring is criterion-referenced with some open-ended questions. The state also requires students to do some writing on the science portion of the test.

LEP students' scores can be excluded if the student is non-English speaking and has been enrolled in U.S. schools for less than two years. The Michigan Department of Education recommends that all limited English proficiency students: (1) take the proficiency tests to qualify for the state endorsed diploma; (2) be permitted to bring their own native language and English dictionaries to the tests; and, (3) be permitted additional time.

Students who have been found eligible for special education services through an individual education plan (IEP) and receive 49 percent or less of their reading-English instruction per week through general education may have their scores excluded as well. All students should take the statewide assessment unless exempted from testing by their parent or guardian.

According to the state's "Testing Guidelines for Students with Disabilities, Limited English Proficiency and Dual Enrollment Eligibility" posted on the Internet, the following are examples of accommodations: flexible scheduling of tests; extended time; more frequent breaks; revised test format (e.g., braille, large type, auditory amplification devices, student records answers in test booklet), flexible setting (e.g., test in a small group or individually in separate location, special lighting, special furniture, etc.) revised test directions, and use of aids and devices. As posted in the same section, "an accommodation is the process of adjusting the physical, psycho social or cognitive requirements of a situation to enable an individual with a disability to perform required tasks or behaviors. Instructional accommodations are provided so that an individual may receive the full benefit from instruction and may learn to use accommodations successfully when needed in future academic and nonacademic settings. Testing accommodations are provided so that the effect of a disability is minimized and so a student is provided an opportunity to demonstrate the degree of achievement he or she actually possesses.

In addition to MEAP, each school administers other tests—for example, the Iowa test, the Stanford test, and the Metropolitan test. Each school selects the type of test it would like to administer. Although the SEA has this assessment system in place, according to *The State Policy System Affecting Science and Mathematics Education in Michigan*, "if Michigan wants to develop and implement a testing program that is closely aligned with emerging national visions for mathematics and science instruction, state government will have to invest significantly more funds in assessment than has been the case up until now."

Course Taking/Ability Grouping/School-to-Work

LEAs set their own requirements for high school graduation. Additionally, it is up to each school district to determine if and what specific math and science courses are required in order to receive a high school diploma. At present, the state does not have specific course requirements. However, part of the reform effort focuses on having more math and science taken by all students, with algebra taken by all. (Some schools require three years of both math and science;

unfortunately, disaggregated data on this topic is unavailable at this time.)

Within the structure of the Michigan Department of Education, under the Office of Enrichment and Community Services, there are identifiable units that provide technical assistance to schools on race, gender, and Native American issues. Services in these units include teacher professional development and providing resources to engage these groups in learning.

Ability grouping is an LEA decision. The SEA's new curriculum is focused on getting all students involved in problem-based learning. Therefore, students at varying levels of ability are enrolled in the same class. Many school districts offer an accelerated option for high-ability students, especially in math, moreso than in science. With respect to science classes, non-college track students tend to take courses other than chemistry and physics.

The School-to-Work office is housed within the Michigan Jobs Commission. Currently, school-to-work programs are not mandated at the state level.

School Financing/Resources

In Michigan, the tax rate in mills, applied to the state equalized valuation of the district, is used to produce revenue for the operation of schools. According to the 1995 edition of the Council of Chief State School Officers' *State Indicators of Science and Mathematics Education*, average current expenditures are $6,538 per pupil.

To support improving opportunities for all students to learn, the Michigan Legislature forged a more equitable school funding plan that was supported by the electorate in March 1994. Thus, each of the 556 school districts are guaranteed a baseline allocation of $4,200 per pupil and $5,000 per pupil over the next five years. This marked a substantive increase for some of the poorer districts whose spending was as low as $3,277 per student. In addition, funds are earmarked for students at risk of failure.

Michigan is a local control/home rule state. What is taught, when, and how it is taught are matters determined by local school boards and administrators. Inventories of resources are not taken. With respect to technology, the last formal survey was conducted in 1989. At that time, the average was 16 students to a computer. Since then, hardware has been purchased and installed in a variety of schools; however data is not currently available.

Michigan also has a Telecommunications Act, Public Act (PA) 179 of 1991, that focuses on technology in terms of affordability, access, pricing, and equity issues.

Statewide Systemic Initiative

Michigan is moving in the direction of math and science education reform and making a point of infusing equity throughout this entire process. In 1992 the Michigan SEA received funding of $10 million dollars over 5 years from the National Science Foundation's Statewide Systemic Initiative Grants Program. Divided into components, the SSI encompasses the following areas:

- program and policy review. Increase the coherence and power of state-level support and guidance for science and mathematics;
- teacher education redesign. Staff from public universities and many private and independent colleges meet twice a year to talk about mathematics and science. From such meetings, strands were developed, and local alliances (a high school in an urban district, a community college, and a local university) were formed. Their goal is to first, focus on getting minority students to teach mathematics and science and, second, to look at providing experiences for pre-service teachers in schools;
- communications. Disseminate information to schools, legislators, universities, and others, for example, the *MSSI Exchange* quarterly newsletter, brochures, videos, and presentations;
- management and governance. Manage the National Science Foundation grant and connect with the Michigan Department of Education and key partners to plan and develop the initiative;
- evaluation. Work with the model components and help with the design and evaluation of conferences as well as evaluate the overall initiative—both formative and summative. Information learned is used to improve the mission of the initiative;
- models of effective learning. To quote the *MSSI 1992-93 Annual Report*, the goal is to help "focus districts build community coalitions that will provide information of the type of infrastructure

BEST COPY AVAILABLE

needed to support the new directions of teaching and learning at both the state and local levels and address systemic reform of mathematics and science education;" and,

- professional development and dissemination. Focus on making connections to existing people and resources to enhance the professional growth and development of teachers.

One example of focusing the SSI on equity issues is to examine in greater detail the component on the models of effective learning. Within this component, there are 22 districts—urban, suburban, and rural—that represent Michigan's diverse populations. The component's overall premise is to examine what will be needed to ensure all Michigan school districts will begin the process of mathematics and science education reform. To quote the *MSSI 1992-93 Annual Report*, "each focus district addresses four focus areas: systemic reform, mathematics and science education, community coalition building, and issues of under-representation/equity."

Urban Systemic Initiative/Other NSF Grants

Detroit is an urban systemic initiative (USI) site. Having a five-year grant, it began its third year in 1996-97. In brief, the goals of the Detroit USI are as follows:

- to improve the mathematical and scientific literacy of all students;
- to provide the mathematics and science fundamentals to enable students to participate fully in a technological society; and,
- to enable a significantly greater number of students to pursue careers in mathematics, science, and engineering.

A great deal of communication and networking goes on between the state's USI and SSI. Individuals from both initiatives participate in each other's boards, attend meetings, and communicate frequently.

In terms of other NSF grants, a plethora exist. Some examples are as follows: Connected Mathematics Project (middle school math curriculum development based at Michigan State University); CORE Plus Mathematics Project (high school math curriculum development based at Western Michigan University); Blue Skies and Weather Underground (earth science resources for technology based at the University of Michigan). Connections between these projects and the SSI are made in terms of linking the projects to the school districts involved with the SSI as well as the broader infrastructure within the state.

Policies that Foster Equity/Inclusion

In terms of state programs, PA 25 of 1990 brought about a set of reform initiatives that established a legislative framework for statewide school improvement. A brief outline of PA 25 follows.

1. It requires schools to provide an annual district and school building report to the public each year.
2. It establishes a system of accreditation for schools within the state and identifies schools that are not performing well. (The state could potentially take over or force a school to close.)
3. It has a school improvement requirement, requiring each school to develop a comprehensive school improvement plan. Such a plan is updated annually, by a committee that is responsible for implementing the plan.

It establishes core curriculum requirements, requiring every school to have some type of written core curriculum (the things students are required to know and to do) and high school proficiency tests.

In addition, PA 336 of 1993 focuses on the intellectual, cultural, social, emotional, and physical needs of four year olds and school-aged students not meeting standards. The Quality Issues Amendments Legislation (Public Act 335-339 of 1993) strengthens PA 25 and includes adult roles, core academic curriculum, and professional development.

Special State-Based Equity Programs

Michigan Mathematics and Science Centers. Through outreach and accelerated activities, these centers are committed to the systemic improvement of math and science education. Of the 25 math and science centers and eight satellite centers, eight operate accelerated part-time schools in math and science. (In some cases, the centers offer AP classes.) Each center has its own emphasis as well as its own equity focus, contingent upon its geographical location.

The master plan of all the centers is to increase student achievement in math and science; equalize access to higher levels of math and science; and foster a

citizenry capable of making informed decisions regarding scientific and technological issues. To learn a bit more about each center's focus, each center was contacted via e-mail. Out of the 25 centers and eight satellite centers, eight replied. Example activities related to the promotion of equity follow.

- The Northwoods Math Science Center conducts a Girls' Math/Science Conference.
- The Clear Lake Education Outdoor Center has a multicultural five-day residential experience. They also sponsor a teen parenting camp and a Native American Camp.
- The Chittenden Education Center focuses on a rural population. Located in a region in which the main source of income is pulp-cutting, the community-at-large is quite aware of environmental issues. Consequently, Chittenden gears its programs toward environmental issues and environmental research.
- The Huron Center deals with equity in three ways: open programs, special programs, and information programs. The centers help the school to analyze data from both racial and gender perspectives, disaggregates the data, examines gaps, and then develops special activities.
- The Capital Area Center links with local organizations, e.g., Black Child and Family Institute, to promote their center's activities.
- The COOR Science/Mathematic Satellite Center (stands for Crawford, Ogemaw, Oscodo and Roscommon Counties) organizes and hosts the Girls+Math+Science=Choices conference for middle-school girls.
- The Grand Traverse Regional Center acknowledges the need to address discrepancies in math/science opportunities for minorities in their mission statement.
- The Berrien County Center addresses equity on several fronts: sponsoring a Girls+Math+Science= Choices conference; hosting a Midwest Talent Search SAT test with a large number of minorities taking the test; encouraging underrepresented groups to participate in their half-day pull out accelerated program; and hosting a summer program for students entering the seventh grade.
- The Detroit Center functions to improve the quality of mathematics and science education for all Detroit students, providing a foundation of skills, knowledge, and attitudes that will enable these students to function and live successfully in a technological society.

The Girls+Math+Science=Choices. This program targets middle schools. Its primary activity is a one-day conference designed to encourage middle schools girls in math and science; the model includes key components for parents to assure they have an awareness of the importance of these subjects to their daughters' future choices. According to the program contact, over 20 conferences are held throughout the state each year, impacting over 50 percent of Michigan's most talented middle school females. "These conferences typically have 80–90 percent of the girls attending with one or both parents."

"Michigan Gateways." This is a television series that has helped further math and science education reform by presenting broad ideas and discussion. The program was first broadcast via satellite to school districts; it is now on video. Their last new program was in December 1995. They are currently seeking funding. As a free satellite broadcast, any school, district, or center with the equipment and desire to do so could downlink and record the program, whose primary target audience is K-12 math and science teachers. However, the programs are also designed to appeal to school administrators, parents, and community leaders.

Connecting with the Learner: An Equity Toolkit. This is a facilitator guide that contains activities related to equity. Sponsored by the Michigan Department of Education in cooperation with the MSSI, portions of this project are supported by the Eisenhower Professional Development State Leadership Program, North Central Regional Education Laboratory (NCREL), the Midwest Mathematics and Science Consortium, and SERA, based at the American Association for the Advancement of Science. Educators in leadership roles who are responsible for facilitating reform and the development of equitable practice in mathematics and science education comprise the audience for the toolkit. To quote from the guide, "the kit was developed to unite the research and expertise needed to understand and develop means to achieve excellence and equity within the school environment."

The toolkit was piloted with over 200 individuals. To date, more than 50 reviews of the toolkit have been

received. Approximately 150 school districts are working with the toolkit.

SERA. In 1994, the Michigan Department of Education, its Mathematics and Science Action Team (whose members represent 14 units within the SEA), and the MSSI received a grant from SERA to promote high quality mathematics and science for *all* students. At a retreat in September 1994, SERA staff, the Mathematics and Science Action Team Staff, and the Equity Action Team staff received an overview of the MSSI vision for teaching and learning science and mathematics and discussed issues related to achieving this vision for ***all*** students.

As a result of this retreat, staff decided that an equity strategic plan needed to be developed. To begin the process, SERA funds were used to contract a consulting agency to conduct a needs assessment and survey of current equity efforts within the Michigan Department of Education. The information gathered from this assessment will be used as the basis for continued discussion within the SEA on equity issues.

The SERA project has made many connections with education programs within the state government as well as education associations. For example, the Michigan Science Teachers Association used SERA funds to support a keynote speaker at their 1996 conference. The speaker addressed equity issues and examined how the Association could include equity in the scope of its work. In addition, as a result of conversations that were prompted in a initial meeting held for SEA staff, the Michigan Science Teachers Association features a column in their newsletter regarding "Science for All."

SERA funds were used to initiate the development of an equity toolkit that will be part of the support materials for the *Michigan Curriculum Framework*. SERA funds helped to leverage the complete development of this over the past two years; funds from the MSSI, Eisenhower, and the NCREL Mathematics and Science Consortium were used also to support this effort.

Furthermore, SERA funds and expertise were used to bring together Michigan African American superintendents to discuss strategic planning, building capacity, and professional development. This led to the application for further funding to the Kellogg Foundation and NSF in order to focus on planning and leadership skills to lead districts in systemic reform efforts.

North Central Regional Educational Laboratory (NCREL). NCREL has been working with Michigan through the Mathematics and Science Consortium (MSC) located at NCREL. A grant from the National Eisenhower Program is funding research, innovation, and systemic improvement in mathematics and science. Michigan is one of the seven states that the MSC serves. Michigan school districts are provided with technical assistance through mailings from NCREL. The MSC staff work with MSSI staff in the areas of professional development and building professional learning communities.

In terms of the MSSI, the MSC is working on three activities, two directly related to building professional learning communities: (1) working with directors of the math/science centers to promote the idea of using professional learning communities as a delivery system for professional development; (2) working intensively to support the use of cases and case discussions as a form of professional development, i.e., using teachers' stories that present instructional dilemmas, how these teachers have been affected by these problems, and the solutions they developed to resolve these challenges; and (3) assisting in the development of the equity toolkit.

The consortium began working with SERA and the MSSI in 1994 as design team members in developing the equity toolkit. These partners participated in design team meetings as well as writing, reviewing, and rewriting and worked with NCREL evaluators to create an evaluation plan for the pilot equity toolkit. The Mathematics and Science Consortium is currently funding the complete editorial and graphic components of the toolkit, and, in doing so, has double-matched the funds initially distributed by the SERA grant. The goal is to print 4,000 copies, 1,000 of which will be distributed throughout the Michigan Department of Education and to toolkit reviewers. The other copies will be sold at cost through NCREL.

The MSC has also done a great deal of work with the Urban Systemic Initiative. For example, they held a leadership summer training program for Detroit USI school administrators. In addition, the MSC is working with school principals in Detroit to promote the idea of using professional learning communities as a delivery

system for professional development. The MSC also works with the Michigan Department of Education in developing the state's curriculum frameworks in mathematics and science, providing technical assistance on the full development of the frameworks. For example, a handbook and a videotape showing cases of effective professional development in mathematics and science planning and implementation from around the state are being developed. Both the video and the handbook will support LEAs to use the frameworks.

Teacher Licensing/Training/Professional Development

According to Thompson, Spillane, and Cohen, "although all teachers seeking state certification to teach mathematics or science in grades 7–12 are required to take a substantial amount of course work in mathematics and science, there is nothing in current state regulations to connect these courses to the new national standards for mathematics and science instruction. There are no course credit requirements in either science or mathematics for those seeking state certification to teach elementary grades." While the SEA does not require mathematics or science course credit requirements for state certification to teach elementary grades, some of the local universities impose such requirements on students seeking a teaching degree.

However, the Michigan Test for Teacher Certification is closely aligned with both state and national standards for mathematics and science. As stated in the systemic initiative section, there is a teacher education component to the state's SSI. The Michigan SSI is attempting to enlist support from within the universities to develop a set of guidelines that define the type of teacher education program necessary to prepare teachers to teach in a way consistent with new ideas about science and math education. Another new development in the state is the introduction of a mentoring program for teachers. PA 335 requires that all new teachers be assigned by their school to a master teacher, college professor, or retired master teacher who will serve as a mentor during their first three years of teaching.

The Michigan Statewide Systemic Initiative–Teacher Education Redesign is fostering existing connections between four-year institutions, community colleges, and school districts with the goals of (1) increasing the number of minority students who choose math and science teaching as their college major, and (2) better preparing these future teachers for teaching in urban settings.

With respect to English-as-a-Second-Language teachers who teach LEP students, there are no licensing standards. However, to qualify as a bilingual instructor, teachers must be proficient in both the oral and written skills of the language for which they are endorsed.

All of the math and science centers run professional development programs. To quote from their mission statement, the purpose of having professional development programs is to "assure equity of opportunity for every student's teacher to have access to current knowledge about science and mathematics and the effective teaching of these subjects."

Also, as noted in a 1994 National Governors' Association report on professional development, Michigan was awarded a grant from the National Governors' Association and the Carnegie Corporation of New York to support development of a strategic action plan for professional development.

Early Childhood Education

In 1993, PA 336 increased funding for the implementation of early childhood development programs for four-year olds at risk of school failure. The Michigan School Improvement Plan indicates that the pathway to high standards and high performance starts before kindergarten.

The early childhood staff works collaboratively with Michigan's health and human service agencies and other early childhood services to provide comprehensive early childhood programs. These programs emphasize parental and community involvement. At present, there are no science, math, and technology (SMT) programs in the early years mandated by the SEA. Rather, some local programs offer SMT activities as part of their daily program for young children. State and federal funds managed in the early childhood unit include:

- the Michigan School Readiness Program ($52,730,500 in State School Aid and $10,528,000 in competitive grants to private, non-profit early childhood agencies);
- Part H of the Individuals with Disabilities Education Act/Early On Michigan ($8,232,797);

- Even Start, an early childhood and family literacy support program ($349,600); and a portion of the Child Care and Development Block Grant for the enhancement of early childhood services ($480,000).

In addition, this unit provides consultation and technical assistance for kindergarten and primary multi-age programs; manages the Child Find component for Special Education; and provides consultation on early childhood special education issues.

Staff in the health education unit also work with other state health and human service agencies. They provide support for comprehensive school health programs ($161,000) and AIDS education ($73,200) and staff physical education programs in schools across the state.

Title I Programs

With respect to Title I, Michigan had a tutorial type of a model. Students having difficulty in math were given more drill and practice. With the reauthorization (funds can be applied to other content areas), Title I's emphasis has shifted toward alignment with the state's content standards. In fact, Title I schools need to show improvement on the state assessment test. Schoolwide programming in Title I schools is becoming a primary focus in Michigan. Because of the overall state policy on school improvement, more attention is being paid to equity issues.

Michigan's state legislation has an accreditation process. When the Michigan Department of Education accredits a school building, two components are considered: (1) the *Michigan Accreditation Standards Report* (which stipulates 103 standards that a school building is required to meet) and, (2) three consecutive years of MEAP scores in four test categories—math, science, reading for information and reading for story selection. Three categories of accreditation follow:

- summary. To be deemed a summary school (a fully accredited school), a school building must meet all 103 standards and 66 percent of its students must score at or above the satisfactory level in all of the test categories tested in two of the last three consecutive years. (The MEAP office defines three categories for testing—satisfactory, moderate, and low; satisfactory is the highest.) There are 260 summary schools;
- interim. To be deemed an interim school, a school building may or may not meet all 103 standards and 50.1% or more of the students must score at the satisfactory level in at least one of the test areas in any of the three previous years. There are 3,000 interim schools, some of which are 1/10th of a point away from getting summary accreditation. By the same token, some schools barely reach the interim status;
- unaccredited. To be deemed an unaccredited school, a school building may or may not be meeting all of the 103 standards, and 50% or less of its students score at the satisfactory level in any of the three previous years on any of the four test categories. There are 39 unaccredited schools at present, the vast majority of which are Title I schools. At the end of the 1995–96 school year there were 93 unaccredited schools. This number dropped to 39 within one year's time, largely because these schools had been working toward improving student achievement for some time. In order for a school to become reaccredited, the students in the school need to achieve above 50 percent on their achievement tests or show steady improvement.

When a school receives an unaccredited status rating, they are required to undertake a comprehensive self study and write an action plan (school improvement plan) that is aligned with their building and district school improvement plans and focuses on improving student achievement and Title I programs. Technical assistance is made available to these schools to complete their self study and write their action plan.

In terms of demographics, those unaccredited schools show a large, low-income population. They tend to be schools that are not well organized in terms of school improvement and student learning. Accordingly, statewide funds have been provided to technical assistance providers who have worked individually with schools via a multifaceted process. Each school has had two visits from the technical assistance site team, visits that focused on student learning. The goal is to align professional development with the school's improvement plan. The improvement plan, in turn,

should center on student learning—areas in which students are succeeding—as well as examine areas that need improvement within the school, e.g., resources, professional development.

A $1.5 million grant was received from the state for technical assistance. This amount was used first with the unaccredited schools and then toward those interim schools identified as the lowest scoring schools. Until 1995-96 there had been only one provider, the Achievement Group, a consortium of intermediate school districts that provided very direct and targeted services—onsite services as well as bringing schools together in small regional meetings or state meetings to share data and resources. For the 1996–97 school year, two grant applications were approved: the Achievement Group and the Michigan Coalition of Essential Schools. The schools will select which provider they want to use.

One of the goals of technical assistance is to bring the unaccredited schools together. After meeting with all of the unaccredited schools, the technical assistance team divides them into groups that will work together on a regional basis. These groups, in turn, hold meetings. Four or five schools come together to discuss what activities they are conducting to improve student learning.

Gifted Programs

According to a Michigan Department of Education official, some of the more affluent schools are having difficulty selecting students to participate in the "pull-out" programs. The network of math and science centers offer advanced courses. Detroit Public Schools, via the Detroit Mathematics and Science Centers, offer a number of magnet schools that specialize in the sciences. Programs include Saturday and summer academies, research apprenticeship programs, Gifted and Talented Super Saturdays, advanced studies, academic gaming, science fairs, the Detroit Area Pre-College Engineering Program, and Science Connection. PA 160 of 1996, the postsecondary Enrollment Options Act, allows qualifying high school juniors and seniors to take college-level course credit at community colleges, colleges, and universities. This dual-enrollment strategy requires that the student's resident school district pay the college's tuition for those who qualify. A large number of gifted students are participating in this program.

Another Department of Education official noted that Michigan is known for the large number of students who participate in AP math and science courses such as chemistry, calculus and physics. Note the following data gathered from the website of the Michigan Department of Education.

- In 1994, 3,244 students in Michigan took AP examinations in Calculus AB and BC, up from 3,193 students in 1993 and 2,945 students in 1992.
- In 1994, 1,630 students in Michigan took an AP examination in Biology, up from 1,380 students in 1993 and 1,171 students in 1992.
- In 1994, 1,145 students in Michigan took an AP examination in Chemistry, up from 1,127 students in 1993 and 974 students in 1992.
- In 1994, 793 students in Michigan took AP examinations in Physics B, Physics C-Mechanics, and Physics C—Elec/Mag, up from 709 students in 1993, and 559 students in 1992.

Bilingual Education

According to Thompson, Spillane, and Cohen, little evidence can be found to link these programs to more support for the state and national visions for mathematics and science education. During a policy and program review of the MSSI, Thompson, Spillane, and Cohen were told by bilingual staff that the goal for LEP students was to receive content area instruction in their native language and English and to have opportunities to develop proficiency in English. "State Board regulations for Bilingual education pay little attention to issues of curriculum and instruction, focusing instead on procedures for the identification of LEP students and the mechanics of providing them with bilingual services."

Posted on the Michigan Department of Education's homepage is the following mission statement.

The mission of the Michigan Bilingual Education Program is to ensure that local districts provide limited English proficient students opportunities for academic success through bilingual education and other effective academic intervention strategies. This mission is specifically addressed by:

- Enforcement of Michigan Public Act 294, 1974 (Bilingual Education Law) which requires school

districts having an enrollment of 20 or more eligible children of limited English proficiency in a language classification in grades K-12 to establish and operate a bilingual instruction program for those children.

- Monitoring of Bilingual Education and Emergency Immigrant Education programs for compliance with state law and administrative rules.
- Providing technical assistance to Bilingual Education and Emergency Immigrant Education programs.
- Distributing Section 41 funds ($4,212,000) of the State School Aid Act to eligible districts operating bilingual education programs.
- Distributing Emergency Immigrant Education Program federal funds to eligible districts.
- Providing technical assistance to school districts applying for federal Title VII Bilingual Education funds.
- Providing professional development to school administrators, teachers, teacher aides and community members related to bilingual, national origin, Title VII and Emergency Immigrant Education Programs.

A special project under bilingual education is the Michigan's King/Chávez/Parks Initiative which sponsors a college day program that provides funds to public and private four-year universities in order to introduce students in grades 6-11 to college preparatory information, knowledge, and skills while on a university campus. The initiative also provides technical assistance to promote cooperation among postsecondary institutions, LEAs, parents, and community organizations in order to increase the number of traditionally underrepresented students in college preparatory courses.

Special Education

The goal of the special education unit is to meet the individual needs of each handicapped student in order to develop the maximum potential of each handicapped person. The Special Education State Plan includes no references to mathematics or science, and the topic of curriculum is touch upon only nominally as one of several areas for which the Michigan Department of Education may allocate grant money (Thompson, Spillane, and Cohen, 1994).

While there is no shortage of special programming, no data are available. LEAs receive guidance from the state on district and school obligations under the Equal Employment Opportunity Act (EEOA) and Title VI of the Civil Rights Act.

The Office of Special Education, in collaboration with Michigan Rehabilitation Services, has completed materials for the special needs population that focuses post school transition activities on the world of work as well as community.

Charter Schools

Public Act 416 of 1994 governs the establishments and operation of public school academies as charter schools. After careful review, 34 schools have been granted contracts to operate under the charter school law. In addition to content focus, focus on some of these schools include alternative programs to prevent school dropouts and improve low achievement and holistic programs to serve students with learning disabilities and attention deficit disorders.

MICHIGAN

Background Characteristics	
Number of public high school graduates, 1993-94, (1996)	83,385
Percent of all 19-20 year olds with a high school credential (1990)	86
Percent of all 23-24 years olds with a high school credential (1990)	88
Number of PreK-12 Students in Public Schools (1996)	1,614,784
Revenues for public elementary and secondary education, Pre K-12, 1994, (1996)	$11,143,083
Expenditure per pupil (1996)	$6,171
Per Capita Income (1990)	$14,154
Percent of Children in Poverty (1993-94)	24.3
Parents' highest level of education (college/high school), reported by percentage of grade 8 students (1992)	38/26
Percent of Mothers 18-19 Years of Age with Less Than 12 Years of School (1988)	46.9

Sources: U.S. Department of Education, National Center for Education Statistics, compilation of data from *The Condition of Education 1995* and *The Condition of Education 1996* as well as *Digest of Education Statistics 1994* and Council of Chief State School Officers *State Education Indicators, 1993*.

Outcomes:
Percentage of Grade 8 Students at or above Basic Mathematics Level by Race/Ethnicity, 1992 NAEP

White	75
Black	22
Hispanic	44
Asian/Pacific Islander	N/A
American Indian	N/A

Source: Council of Chief State School Officers, *State Indicators of Science and Mathematics Education, 1995*, Washington, DC 1995.

Outcomes: Average Proficiency of 8th Graders in each of the Five Mathematics Content Areas as Measured by the 1992 NAEP Mathematics Report Card for the Nation and the States

Numbers and Operations	270
Measurement	266
Geometry	261
Data Analysis, Statistics, and Probability	268
Algebra and Functions	267

Source: U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics, 1994*, Washington, DC, 1994.

Systemic Reform Efforts

There is the view that education reform should be done systemically. How far along is Michigan in implementing the following initiatives?

Curriculum guides or frameworks revised to meet NCTM *Standards*	Yes
State developing alternative student assessment in math or science	Yes
Teachers placing heavy emphasis on geometry and algebra, percentage of students	21/47
State releases a public report with district or school level data	Yes
State has defined a set of learning outcomes in math or math incorporated in core interdisciplinary outcomes	Yes

Source: Council of Chief State School Officers, *State Curriculum Frameworks in Mathematics and Science: How are they Changing Across the States?* May, 1995

Policies and Practices in Mathematics

Percent of math teachers with major in assigned field, grades 7-12, main assignment/all; (1990-91)	64/48
Teacher assessment for certification (1995)	No written test. No performance assessment.
Credits in math required for elementary/middle/ secondary teacher certification in math (1994-95)	major or minor/18/30
Teachers placing heavy emphasis on numbers/operations and measurement, percentage of students (1993c)	63/20
Teachers placing heavy emphasis on geometry and algebra, percentage of students (1993c)	21/47
Percent of high school students taking key math courses (1993): • algebra • algebra II • calculus	 18 11 1
Math graduation requirements in Carnegie course units for a regular diploma (1994)	3
Math proficiency/competency test required for high school graduation (1994)	Yes
Grades and type of test scoring (1993-94)	4, 7, 10; criterion-referenced

*NSR—No state requirement

Sources: U.S. Department of Education, National Center for Education Statistics, compilation of data from *The Condition of Education 1995* and *The Condition of Education 1996* as well as *Digest of Education Statistics 1994* and Council of Chief State School Officers, *State Education Indicators, 1993* and Council of Chief State School Officers *State Curriculum Frameworks in Mathematics and Science, 1995*.

Note: In early 1997, the Michigan Department of Education will release a new curriculum framework.

BEST COPY AVAILABLE

CASE STUDY: SOUTH DAKOTA
A Look at How South Dakota Is Infusing Equity and Excellence into Systemic Reform

Context

South Dakota has a population of slightly more than 700,000, with approximately 60,000 Native Americans residing on nine reservations in areas remote from even small population centers. Fifty-one percent of the population is female. Almost 28 percent of the state's total population is concentrated in its three major cities: Sioux Falls, Rapid City, and Aberdeen. The state's economy focuses on agriculture and ranching, with a marked increase in service industries. Dropout rates for Native American students are 50 percent to 70 percent, and their performance on the Stanford Achievement Test in science ranks in the lower quartiles. Between 1993-94 and 1994-95 there was a slight increase in the scores of Native Americans on the science portion of the test. South Dakota does not have a large, varied minority population, except for Native Americans. According to the 1994 census, South Dakota has a total population of 723,655: 662,338 White; 3,543 Black; 53,727 Native American; and 4,047 Asian.

Vision

The South Dakota SEA is driven by the belief that all students in grades K-postsecondary should be able to fully participate in a society that is changing dramatically as a result of rapid, significant advances in mathematics, science, and technology. It envisions schools in which the development of mathematics and science concepts is facilitated by the use of hands-on activities, authentic assessment, and the appropriate use of technology. It envisions classrooms that develop the potential of all students; that integrate mathematics, science, and communication skills; that promote flexible scheduling; and that maximize the use of electronic networks. Through postsecondary partnerships, teacher preparation programs encourage the use of technology and promote systemic change.

Frameworks/Guidelines/Standards

In June 1996, the State Board of Education adopted the *South Dakota Content Standards*, which cover nine subject areas; they have been mailed to the superintendent of each school district in South Dakota. These *Standards* are aligned with national standards, curriculum materials, and classroom practices. The SERA Action Committee is working with the SEA to integrate the *South Dakota Equity Standards in Education* into workshops and trainings being developed to assist schools in implementing the content standards.

Statewide Student Assessment

A standardized test is administered to grades 4, 8, and 11, at the state level. LEAs select the norm-referenced test to be administered, for example, the Metropolitan or the Stanford. Currently, 75 out of 237 districts are using the Metropolitan test. The state assessment system is under revision, the goal being to align the assessment system with the state's content standards. Through the South Dakota SSI, a statewide performance assessment was conducted over a three-year period with schools that were SSI projects. As a result of this assessment, as well as workshops and training sessions held to score the assessments, many schools are in the process of developing their own assessment system.

If an LEP student has been enrolled in a U.S. school for less than one year, he or she is exempted from the state assessments required of other students. This policy also applies to foreign exchange students. Statewide data is not collected for exempted students. However, districts are using alternative methods such as the language assessment survey and portfolio assessment for LEP students. There are no assessments in languages other than English. Special accommodations are not made for Native American Students. Assessment data is

available to schools in a disaggregated fashion, but it is not published in such a fashion.

With respect to special education students, an enlarged print version of the Stanford test is available. LEAs decide if and how other accommodations are to be made, for example, enlarging the circles on the test. In the near future, the rules regarding accommodations will be revised to reflect inclusion.

Course Taking/ Ability Grouping/School-to-Work

In order to obtain a high school diploma, students must take two units of math, such as Algebra I or II; Geometry; or Trigonometry. In addition, students must take two lab science courses, such as physical science, earth science, or biology.

South Dakota has no formal policy on ability grouping. Each local school district, and, in some cases each school, makes its own decision with respect to ability grouping.

School-to-work programs are administered by the state's Department of Labor. In 1995 the Department of Labor identified career clusters; one of these clusters is science. The department is asking schools to reorganize their curriculum course offerings by career clusters to help students realize that science is important. In fact, science is required in virtually every career cluster.

The Department of Labor has also integrated academic and vocational learning through its professional development workshops and its examination of students' work-based learning.

School Financing/Resources

According to the 1995 edition of the CCSSO' *State Indicators of Science and Mathematics Education*, average current expenditures are $4,738 per pupil. Bureau of Indian Affairs schools are financed by federal funds from the Department of Interior.

The majority of schools in South Dakota have computers. Since South Dakota is such a rural state, one of the ways that teachers and students can communicate with one another is via computer. Technology and Innovations in Education (TIE), an organization founded to offer information and training activities on technology-based applications for South Dakota teachers and administrators, estimates that there is one computer for every eight students.

TIE does some tracking of data. For example, TIE recently received a technology challenge grant from the Department of Education; this grant will allow them to track data and conduct technology audits of some schools. Due to limited funding, however, TIE does not have sufficient resources to track data at all schools.

Each spring, TIE holds a technology conference for classroom teachers. The conference is geared towards all content areas. It focuses on what is new in technology.

Policies that Foster Equity/Inclusion

In terms of equity policies, the Department of Education and Cultural Affairs follows the same guidelines as the Office of Civil Rights: service to all students. Their mission statement follows: "The South Dakota Department of Education and Cultural Affairs shall advocate for education, facilitate the delivery of statewide educational and cultural services, and promote efficient, appropriate, and quality educational opportunities for all persons residing in South Dakota." Gender and race policies also follow the same guidelines as the Office of Civil Rights. For example, there is support of women in non-traditional careers, e.g., Expanding Your Horizons, a project targeted toward females and minority youth. Speakers discussed and focused on mathematics, science, and engineering careers. In addition, careers offered by vocational schools were also examined.

Workshops on sexual harassment are conducted for school districts, teachers, certified and non-certified employees (e.g., bus drivers, janitors, cooks), and parents. Such workshops are held generally at state PTA conferences and at school sites. In addition, all school districts are required to have a sexual harassment policy based on federal guidelines. Since, however, Title IV Civil Rights funds from the U.S. Department of Education have been cut, it is uncertain how many sexual harassment workshops will take place in the coming year. The Department of Education and Cultural Affairs uses a 504 manual, which explains the federal statute that prohibits discrimination in any educational environment against persons with disabilities. Similar to the manual used for the Americans with Disabilities Act (ADA), the 504 manual is geared towards school districts.

Statewide Systemic Initiative

The South Dakota Department of Education and Cultural Affairs received support from the NSF for implementing an SSI to improve mathematics and science education in grades kindergarten through graduate school. The period of support ended August 30, 1996.

Local community and educational leaders promoted mathematics and science reform. To quote South Dakota's report to NSF, "...these programs reached nearly 50,000 families with year-round campaign advertising; engaged approximately 13,000 individuals with hands-on math and science activities via mall shows, community science days, and state fairs; incorporated the talents of local teachers in all public engagement activities; and developed working relationships with 18 business partners and several non-profit corporations." In addition, the SSI worked with the states Department of Tourism in an outreach campaign entitled "Learning Doesn't Take a Vacation."

Rural Systemic Initiative

The High Plains Rural Systemic Initiative receives funding from NSF. This initiative brings together 17 American Indian tribal colleges and other entities involved in science, mathematics, engineering, and technical education in Montana, North Dakota, Nebraska, South Dakota, and Wyoming. The 17 tribal colleges are serving as a potent force for positive educational reform, capitalizing on their role as change agents in the region. The High Plains Initiative provides technological support for curriculum development, instructional improvements, and partnership formations. Technology and Linkages, a component of the technological support initiative, has collected information regarding the regions five-state area telecommunications capabilities, conducted needs assessments, and established electronic linkages.

Special State-Based Equity Programs

SERA. As part of the AAAS Science Education Reform for All Project (SERA), the South Dakota SEA formed a SERA action team. This action team is composed of 70 statewide members—from universities, schools, the state Department of Education and Cultural Affairs, education organizations, and local SERA sites—who meet quarterly. The equity goal of the SERA action team is to promote equal opportunities for learning science, mathematics, and technology by removing inequities based on gender, race, socioeconomic status, ethnicity, disabilities, rural isolation, and other factors that may affect students' learning and self esteem. Activities of the SERA action team have included:

- Adapted and developed *Equity Benchmarks* that were distributed to all teachers in South Dakota.
- Conducted or cosponsored teacher training workshops related to the *Equity Benchmarks*.
- Participated in legislative exhibitions on SMT education programs.

The SERA project has made solid connections with numerous education programs in state government as well as with the South Dakota Education Association, Operation SMART in Rapid City, the South Dakota Curriculum Center, Sinte Gleska University on the Rosebud Indian Reservation, the South Dakota Parent Teacher Association, and the Science Linkages in the Community (SLIC) project in Rapid City. Since January 1996, the major focus of the SERA project was the establishment of local SERA projects in four South Dakota schools/districts: Pine Ridge School, Crazy Horse School, Douglas Schools, and Tiospa Zina Tribal School. Using the *Equity Standards* (developed by the SERA action team), each schools local action team has assessed how equitable its education system is for students; each team is working to strengthen equity in one particular area of science and mathematics education, such as assessment, curriculum, instruction, and technology. At their last meeting in September 1996, the SERA action team decided that the development of an Equity Toolkit would be the next step needed for use with the *Equity Standards*. Their plan is to have the Toolkit ready for use by February 1997.

SLIC. The purpose of Science Linkages in the Community (SLIC) is to enhance and promote the Rapid City/Black Hills community's understanding of the importance, applications, characteristics, benefits and multi-cultural basis of SMT. Housed in the South Dakota School of Mines and Technology, with strong connections to the SEA, SLIC provides statewide science teacher training programs and functions as a "science and technology center without walls" by

offering a wide array of community science programs. SLIC strives to put into place a coordinated community effort that provides opportunities that involve and empower a community of leaders through SMT education.

Sinte Gleska University/Native American Mathematics and Science Educational Leadership. This is an NSF teacher-enhancement project that provides professional development for teachers of Native American students, with a focus on science, mathematics, and technology. The three primary goals for this project are as follows:

- Developing leadership capacity in teachers.
- Addressing the needs of Native American students.
- Developing a school culture which supports systemic change.

Girls Incorporated of Rapid City, Operation SMART. Operation SMART was created by the Girls Incorporated (formerly Girls Clubs of America) in the mid 1980s. Originally designed as an informal research and center-based hands-on Science, Mathematics, and Relevant Technology (SMART) program, Girls Incorporated of Rapid City has further developed and refined this program as an elementary teacher-training model for use in rural areas—giving girls a chance to explore, have fun, build skills and knowledge, and increase their self-confidence and aspirations in the field of science. Its overall goal is to improve the performance and persistence of girls in science, mathematics, and relevant technology by creating gender equity awareness via in-classroom instruction and methods to promote knowledge and sensitivity toward more equitable classrooms. In addition, the program strives to create cultural awareness by providing information on minority learning styles and practices.

Teacher Licensing/Training/Professional Development

Teachers of science and mathematics are not required to have majored in these subjects. At the secondary level, teachers may be endorsed in a specific content area by taking 18 hours in the discipline. Such endorsement would be added to the certificate. (Some teachers may have a secondary certificate with four or five endorsements beyond their content major.) Courses must fall within specific areas so that there is some correspondence to the content knowledge that a major in the same content area would have acquired.

Teacher assessment for certification is not required by the SEA. But, a student graduating with a teacher education degree needs to be approved by the degree granting institution for certification. In other words, the degree granting institution will conduct its own assessment.

A state task force has been revising the teacher education and certification rules to ensure they are aligned with South Dakota's *Content Standards*. Regarding the *Content Standards*, the South Dakota Initiative for Challenging Standards is conducting professional workshops—working with 40 school districts; each school district can send up to four teams, of up to nine people per team.

With respect to these *Standards*, an annual bilingual conference is open to all educators. Numerous workshops are conducted statewide to assist educators in providing services to LEP students. In addition, the SEA is developing an ESOL/Bilingual Endorsement for teacher certification. Different courses will be made available through the SEA and various universities for this ESOL/Bilingual endorsement.

Early Childhood Education

Although the SEA is the lead agency, they have not specifically developed early childhood education programs. Rather, both the Office of Comprehensive Services and the Office of Special Education offer preschool and infant-toddler programs. The Office of Special Education provides funds to program applicants via a formula based on child counts and birth census data. The legal entity applies for funds in order to provide services—such as a special educator working with a child at home or in Head Start or an individual serving as an initial service coordinator for the family—for children up to age five.

With respect to SMT programs, the Office of Comprehensive Services, in collaboration with the states Head Start Association, submitted recently a proposal to the National Science Foundation for a planning grant which will serve as a catalyst for development in SMT early childhood programs.

The federal government has expanded the Head Start and Even Start programs over the past five years. Head

Start provides instruction to pre-school-age children from economically disadvantaged backgrounds. Even Start serves a similar population, but it targets parents with low levels of literacy and seeks to educate not just the children, but parents *and* children. All services are based on the child's level of developmental delay (in terms of cognitive skills). From ages three to five, programs are more specific to either a school district or in conjunction with Head Start.

Title and Gifted Programs

1996 is the first year that Title I allows for flexibility in subjects other than reading and math. More than likely, it will be several years before science is the focus of the SEA's Title I programs. Within the Department of Education and Cultural Affairs, personnel in charge of individual Chapter and Title programs, state testing, and the gifted and talented program have been consolidated. Title I still provides supplemental assistance to educationally deprived students around the state, but reorganization has divided the states Title I office into several subparts.

There is no emphasis at the state level on science, mathematics, or technology for gifted students. Program emphasis is determined at the local level. On average, 120 school districts have a membership in the Odyssey of the Mind school program, a program that fosters creative thinking and problem-solving skills among participating students from kindergarten through college. Students solve problems in a variety of areas—from building mechanical devices to giving their own interpretation of literary classics.

Bilingual Education

The state uses the federal guidelines to provide LEAs with information regarding district and school obligations under the Equal Educational Opportunities Act (EEOA) and Title VI of the Civil Rights Act. The Equal Educational Opportunities Office provides technical assistance in the form of conferences as well as workshops to help LEAs and schools comply with requirements under Title VI and EEOA (Council of Chief State School Officers, 1995). Title VII funding from the Office of Bilingual Education and Minority Affairs is used to promote English language proficiency among students. The focus is for the LEP students to receive the same educational opportunities and have access to all of the same programs as other students. The emphasis is for all students to achieve in all subject areas.

Special Education

As noted in a section above, the Office of Special Education deals with preschool and infant toddler programs. It also deals with special education students. One component of this unit is South Dakota Statewide Systems Change, funded by the U.S. Department of Education's Office of Special Education. This project is a cooperative agreement between the South Dakota Department of Education and Cultural Affairs and the U.S. Department of Education. In its second year of a five year cycle of funding, Systems Change provides assistance to educators and families in developing a system of educational services to support students with disabilities in general education settings. The project targets children with severe disabilities, autism or those with dual sensory impairments. With respect to SMT, as well as other disciplines, this group provides strategies on how to adapt the content area so that the student can participate in the activity. The Office of Special Education provides a large variety of presentations and workshops as well as technical assistance guides for parents and educators.

SOUTH DAKOTA

Background Characteristics	
Number of public high school graduates, 1993-94, (1996)	8,442
Percent of all 19-20 year olds with a high school credential (1990)	91
Percent of all 23-24 years olds with a high school credential (1990)	91
Number of PreK-12 Students in Public Schools (1996)	143,482
Revenues for public elementary and secondary education, Pre K-12, 1994, (1996)	$647,026
Expenditure per pupil (1996)	$4,556
Per Capita Income (1990)	$10,661
Percent of Children in Poverty (1993-94)	16.6
Parents' highest level of education (college/high school), reported by percentage of grade 8 students (1992)	N/A
Percent of Mothers 18-19 Years of Age with Less Than 12 Years of School (1988)	36.9

Sources: U.S. Department of Education, National Center on Education Statistics, compilation of data from *The Condition of Education 1995* and *The Condition of Education 1996* as well as *Digest of Education Statistics 1994* and Council of Chief State School Officers *State Education Indicators, 1993.*

Outcomes: Percentile Rank Scores by Ethnicity, Grade 8, Stanford Achievement Test, Science, 1994-95	
White	67
Black	62
Hispanic	46
Asian	77
American Indian	28
No Answer	60

Source: South Dakota Department of Education and Cultural Affairs, Office of Technical Assistance, 1996.

Note: South Dakota does not participate in NAEP.

Outcomes: Percentile Rank Scores by Ethnicity, Grade 8, Metropolitan Achievement Test, Science, 1994-95	
White	67
Black	54
Hispanic	54
Asian	65
American Indian	29
No Answer	64

Source: South Dakota Department of Education and Cultural Affairs, Office of Technical Assistance, 1996.

Note: South Dakota does not participate in NAEP.

BEST COPY AVAILABLE

Systemic Reform Efforts

There is the view that education reform should be done systemically. How far along is South Dakota in implementing the following initiatives?

Curriculum guides or frameworks revised to meet NCTM *Standards*	Yes
State developing alternative student assessment in math or science	Yes
Teachers placing heavy emphasis on geometry and algebra, percentage of students	N/A
State releases a public report with district or school level data	Yes
State has defined a set of learning outcomes in math or math incorporated in core interdisciplinary outcomes	Yes

Source: *Council of Chief State School Officers, State Curriculum Frameworks in Mathematics and Science: How are they Changing Across the States?* May, 1995.

Policies and Practices in Mathematics

Percent of math teachers with major in assigned field, grades 7-12, main assignment/all; (1990-91)	N/A/N/A
Teacher assessment for certification (1995)	No written test. No performance assessment.
Credits in math required for elementary/middle/ secondary teacher certification in math (1994-95)	6/12/18
Percent of high school students taking key math courses (1993):	
• algebra	100
• algebra II or geometry	100
• calculus	N/A
Math graduation requirements in Carnegie course units for a regular diploma (1994)	2
Math proficiency/competency test required for high school graduation (1994)	No
Grades and type of test scoring (1993-94)	4, 8, 11; Norm-referenced

*NSR—No state requirement

Sources: U.S. Department of Education, National Center for Education Statistics, compilation of data from *The Condition of Education 1995* and *The Condition of Education 1996* as well as *Digest of Education Statistics 1994* and Council of Chief State School Officers, *State Education Indicators, 1993* and Council of Chief State School Officers *State Curriculum Frameworks in Mathematics and Science, 1995.*

Note: In June of 1996 the State Board of Education adopted the *South Dakota Content Standards* which cover nine subject areas. These standards are aligned with national standards, curriculum materials, and classroom practices.

BEST COPY AVAILABLE

References and Sources

Blank, R., Brathwaite, B., Hemphill, C., Langesen, D., and Sardina, S. 1995. *State Education Policies on Student Attendance and Use of Time: 1995.* Washington, DC: Council of Chief State School Officers.

Blank, R., and Gruebel, D. 1995. *State Indicators of Science and Mathematics Education 1995.* Washington, DC: Council of Chief State School Officers.

Blank, R., Hemphill, C., Langesen, D., and Sardina, S. 1995. *State Education Policies on K-12 Curriculum, Student Assessment, and Teacher Certification: 1995. Results of a 50-State Survey.* Washington, DC: Council of Chief State School Officers.

Blank, R., Martin, M., and Smithson, J. 1996. *SCASS Science Assessment, Measures of the Enacted Curriculum.* Washington, DC: Council of Chief State School Officers.

Blank, R., and Pechman, E. 1995. *State Curriculum Frameworks in Mathematics and Science: How Are They Changing Across the States?* Washington, DC: Council of Chief State School Officers.

Carnegie Corporation of New York. 1996. *Years of Promise: A Comprehensive Learning Strategy for America's Children.* New York: Carnegie Corporation of New York.

Carnegie Corporation of New York. 1992. *A Matter of Time: Risk and Opportunities in Non-School Hours.* New York: Carnegie Corporation of New York.

Carpenter, J., Heaviside, S., and Malitz, G. 1995. *Advanced Telecommunications in U.S. Public Schools, K-12.* Washington, DC: United States Government Printing Office.

Center for Educational Leadership and Technology. 1995. *A Study of Florida's Statewide Technology Initiatives.* Marlborough, MA: Center for Educational Leadership and Technology.

Cohen, D., Spillane, J., and Thompson, C. 1994. *The State Policy System Affecting Science and Mathematics Education in Michigan.* East Lansing, MI: Michigan Partnership for New Education.

Consortium for Policy Research in Education (CPRE). 1994, 1996. *CPRE Policy Briefs.* Philadelphia, PA: CPRE.

Council of Chief State School Officers. 1995. *Sytemic Reform and Limited English Proficient Students.* Washington, DC: Council of Chief State School Officers.

Department of Education and Cultural Affairs. 1995. *1994-95 Education in South Dakota: A Statistical Profile.* Pierre, SD: Department of Education and Cultural Affairs.

Department of Education and Cultural Affairs, Office of Technical Assistance. 1996. *Achievement Test Data.* South Dakota: Department of Education and Cultural Affairs.

Division of Public Schools. 1995. *Statistical Brief, March 1995.* Tallahassee, FL: Education Information and Accountability Services.

Education Trust. 1996. *A New Change: Making the Most of Title I.* Washington, DC: The Education Trust.

Equity Toolkit Advisory Committee. 1996. *Connecting with the Learner: An Equity Toolkit.* Draft, March, 1996. Lansing, MI: Michigan Department of Education.

Florida Department of Education, 1995. *Florida Equity Action Plan.* Tallahassee: Florida Department of Education.

Florida Department of Education. 1995. *Profiles of Florida School Districts 1994-95 Financial Data.* EIAS Series 96-23. Tallahassee, FL: Florida Department of Education.

Florida Department of Education. 1995. *Trends in the Supply of Minority Teachers.* Tallahassee, FL: Florida Department of Education.

Florida Department of Education, Student Assessment Services Section. 1993-1996. *State and District Norm-Referenced Test Results.* Tallahassee, FL: Florida Department of Education.

George, Y., Malcolm, S., and Van Horne, V. eds. 1996. "The Effect of the Changing Policy Climate on Science, Mathematics, and Engineering Diversity." Washington, DC: American Association for the Advancement of Science.

Jita, L., Lubienski, C., Reimann, C., Spillane, J., and Thompson, C. 1996. *The Local Government Policy System Affecting Mathematics and Science Education in Michigan: Lessons from Nine School Districts.* East

Lansing, MI: Michigan Partnership for New Education.

Matyas, M., and Malcom, S. eds. "Investing in Human Potential: Science and Engineering at the Crossroads." Washington, DC: American Association for the Advancement of Science.

Michigan State Board of Education. 1988. *Essential Goals and Objectives for Mathematics.* Lansing, MI: Michigan State Board of Education.

Michigan State Board of Education. 1991. *Essential Goals and Objectives for Science Education.* Lansing, MI: Michigan State Board of Education.

Michigan State Board of Education. 1994. *Core Curriculum Context Standards Draft.* Lansing, MI: Michigan State Board of Education.

Michigan State Board of Education. 1996. *Michigan Educational Assessment Program Handbook.* Lansing, MI: Michigan Department of Education.

Michigan State Board of Education. 1997. *Michigan Model Core Curriculum Outcomes.* Lansing, MI: Michigan State Board of Education.

Miller, 1996. *Trends in the Supply of New Teachers in the State of Florida.* Tallahassee, FL: Florida Department of Education.

National Council of Teachers of Mathematics. 1989. *Curriculum and Evaluation Standards for School Mathematics.* Reston, VA: National Council of Teachers of Mathematics.

National Governors' Association, Education Policy Studies, Center for Policy Research. *Professional Development for Educators: A Priority for Reaching High Standards.* Washington, DC: National Governors' Association.

National Research Council. 1996. *National Science Education Standards.* Washington, DC: National Academy Press.

National Science Foundation Division of Research, Evaluation, and Communication. 1996. *Indicators of Science and Mathematics Education 1995.* Larry E. Suter, ed. Arlington, VA: National Science Foundation.

National Science Foundation. 1996. *Indicators of Science & Mathematics Education, 1995.* Arlington, VA: National Science Foundation.

Project 2061. 1993. *Benchmarks for Science Literacy.* New York, NY: Oxford University Press.

Spillane J., Thompson, C., Lubienski, C., Jita, L., and Reimann, C. 1995. *The Local Government Policy System Affecting Mathematics and Science Education in Michigan: Lessons from Nine School Districts.* East Lansing, MI: MSSI Policy and Program Review Component.

State of Florida, Department of State. 1996. Florida *Curriculum Framework: PreK-12 Sunshine State Standards and Institutional Practices.* Tallahassee, FL: State of Florida.

State of Michigan, Department of Education. 1994. *Michigan Statewide Systemic Initiative,* Lansing, MI: Michigan Department of Education.

U.S. Department of Education. 1995. *The Conditions of Education, 1995.* Washington, DC: U.S. Government Printing Office.

U.S. Department of Education. 1996. *The Conditions of Education, 1996.* Washington, DC: U.S. Government Printing Office.

U.S. Department of Education. 1994. *Digest of Education Statistics, 1994.* Washington, DC: U.S. Government Printing Office.

Weiss, I.R. 1994. *1993 National Survey of Science and Mathematics Education.* Unpublished tabulations.

Williams, B. ed. July 1996. *Westat*McKenzie Consortium Systemic Initiatives Newsletter.* (1) 1. Rockville, MD: Westat*McKenzie Consortium.

Discover Science and Mathematics in Florida:
Choosing Quality Mathematics & Science Materials and Programs

APPENDIX I

Developed by the Florida Statewide Systemic Initiative

October 1995

(reprinted with permission of the authors)

Discover Science and Mathematics in Florida: Choosing Quality Mathematics & Science Materials and Programs

Florida Statewide Systemic Initiative (SSI)

The vision of Florida's Statewide Systemic Initiative celebrates diversity and focuses on empowering individuals to pursue and support life-long science, mathematics, and technology learning.

One aspect of supporting this vision is the selection of quality materials for mathematics and science learning and teaching. The selection of instructional materials must be consistent with the goals, objectives, and guidelines of the Florida Curriculum Frameworks in Mathematics and Science. Materials/programs for science and mathematics instruction include but are not limited to:

- student assessment materials,
- manipulative and laboratory materials,
- technologies (e.g., computer software, calculators, CD-ROM, video disks, video tape),
- instructional telecommunication programs (e.g., KidsNet listserv, National Geographic Kids Network, FIRN),
- distance education programs (e.g., PBS Mathline, JASON Project),
- textbooks and supplementary materials,
- other printed materials (trade books, curriculum guides, supplemental guides), and
- professional development programs (i.e., teachers, administrators, families).

Instructional materials and programs provide a foundation for a mathematics and science curriculum because they determine to a great extent the science and mathematics that students experience. Instructional materials influence what and how teachers teach and what and how students learn. Good materials and programs can significantly improve students' attitudes toward and achievement in science and mathematics. The recommendations in this document are consistent with the Florida Curriculum Frameworks in Science and Mathematics; National Council of the Teachers of Mathematics (NCTM) *Curriculum and Evaluation Standards for School Mathematics;* NCTM *Assessment Standards for School Mathematics; National Science Education Standards;* NSTA (National Science Teachers Association) *Scope, Sequence, and Coordination of Secondary School Science; and* AAAS *Benchmarks for Science Literacy.*

Quality materials and programs reflect cultural diversity and utilize strategies that research and practice have shown to be successful in meeting the needs of ***all*** students. They contain substantive ideas and methods; the content (subject matter) is treated accurately and correctly; it values depth over breadth; it is organized around big subjects and themes, not around facts; the language is accessible to students; the nature of mathematics and science are represented faithfully; both science and mathematics are presented as enterprises that do not operate in isolation.

In this document, curriculum is defined as the **what** (scope), **when** (sequence), and **how** (program) of an instructional plan for students. The scope is the content, skills, and attitudes that are a part of the program. The scope addresses how much is taught and of what variety. The sequence defines what is taught at which levels and in which courses. The scope and sequence should assure smooth transitions from one level to the next. The program is defined by the experiences that students encounter and includes the strategies and methods that teachers employ.

School districts and schools should develop a system of instructional materials selection in which programs and materials are examined from criteria contained in this document. A checklist is included with this document and is intended to be utilized by educators to examine and evaluate instructional materials. It is organized into three major sections: *Contextual View, Examine Closer,* and *Verification.*

The process should include examining the following areas, which are described on the following pages.

BEST COPY AVAILABLE

- Mathematical and Scientific Content
- Organizational Structure
- Student Experiences
- Teaching Strategies
- Assessment

Mathematical & Scientific Content

The scientific and mathematical content of the curriculum should reflect the Florida Curriculum Frameworks in Science and Mathematics as well as the *NCTM Curriculum and Evaluation Standards for School Mathematics, National Science Education Standards,* and *AAAS Benchmarks for Science Literacy.* The curriculum should take into account the major goals of improving students' abilities to **solve** problems, **reason** mathematically/scientifically, **make connections** to other ideas and experiences, and **communicate** science and mathematics. The content should be comprehensive in addressing the elements of the curriculum at the appropriate instructional/learning and teaching levels. The curriculum should provide for the natural and logical development of scientific and/or mathematical topics across levels.

Problem solving is built into the program at all levels through problem, investigative, or inquiry situations that are sufficiently simple to be manageable but sufficiently complex to provide a challenge. The situations should be relevant and adaptable to individual, small group, or large group instructional settings.

Reasoning is built into the science and mathematics program at all levels. Students should have opportunities to explain and justify their thinking in keeping with their maturity level. At the high school level, students should support their conclusions using formal methods.

Connections are extended throughout the curriculum through mathematics and science instructional activities that interrelate concepts, procedures, and intellectual processes. Connections are made within the disciplines of mathematics and science and across science and mathematics. The real world is connected to mathematics and science and is presented as an endeavor that does not operate in isolation from society and technology.

Communication is an important part of the program. Students should have many opportunities to communicate mathematical and scientific ideas and language. They should have opportunities to explain, conjecture, and defend their ideas in a variety of ways.

The nature of science is presented as being open to inquiry, open to controversy, and nondogmatic in substance.

The nature of mathematics is the development of a repertoire of heuristic problem solving strategies.

The mathematics and science content is standards-based, comprehensive, and appropriate for the students for whom it is intended.

Organizational Structure

The curriculum must be appropriate for all students and should be organized into cohesive units, multi-day investigations, and worthwhile tasks. The purpose of the activities should be clearly defined. The units, investigations, and tasks must be of sufficient breadth and depth for students to develop ever increasing levels of understandings of scientific and mathematical concepts. The activities should include the appropriate use of technology. They should give students opportunities to apply what they know to the discovery or investigation of new ideas in mathematics and science.

Units are organized around major mathematical/scientific ideas and are of sufficient duration for students to develop a broad understanding of science/mathematics.

A high percentage of lessons extend beyond a single day. Lessons address more than one mathematics and/or scientific objective.

Students work on worthwhile tasks that invite them to experiment with a variety of strategies and results.

The program incorporates the appropriate use of calculators, computers, and other forms of technology as tools for students to solve problems. The program should be designed with the expectations that calculators are available to students and that students have access to computers and other forms of technology.

Student Experiences

The program should emphasize **active learning** on the part of students. It should consistently include

activities that call for the investigation and exploration of ideas, problem solving, conjecturing, and verification of results. The program should include "friendly" activities showing students that solving problems may include making "false starts", evaluating solutions, and starting over again if necessary. The curriculum should encourage students to explore concepts at concrete, semi-concrete, and abstract levels at all ages.

Materials encourage students to explore and conjecture in a risk-free environment, even allowing them to make and find errors.

Materials engage students in mathematical and scientific discourse as they participate in concrete, semi-concrete, and abstract activities.

Materials allow students to use manipulative materials (scientific and mathematical) to model situations and to use technology to analyze data, calculate numerical results, and solve problems.

Materials allow students to use equipment and supplies to conduct inquiries and experiments and to use technology to collect and analyze data, calculate results, and solve problems.

Materials encourage students to determine an appropriate response to solving a problem and whether an exact solution or an estimate is appropriate. Students are also expected to choose the appropriate computational procedure: paper-and-pencil, mental calculation, or calculator. Students are also expected to choose the appropriate way to communicate the data.

Materials allow students to develop scientific process skills (i.e., observing, classifying, analyzing data, drawing conclusions, inferring), habits of mind, and communication skills in order to apply scientific and mathematical content to solve problems and make decisions.

Teaching Strategies

The curriculum should provide appropriate support for teachers as they implement the teaching methods recommended in the state Curriculum Frameworks (Mathematics and Science). The program should include strategies for the active involvement of students in their own learning. It should include ideas on how teachers can teach the content in a variety of grouping patterns within the classroom. The program should include suggestions on the appropriate use of calculators, computers, and other technology to enhance instruction.

The materials assist teachers in meeting the instructional needs of ***all*** students.

The learning strategies suggested are appropriate for the level of the learner and the intent of the learning experience.

The materials provide suggestions that assist teachers to help students meet the major goals: learning to value mathematics, becoming confident in their own ability to learn mathematics, becoming mathematical problem-solvers, learning to communicate mathematically, and learning to reason mathematically.

The materials provide suggestions that assist teachers to help students meet the major goals: learning to value science, becoming confident in their own ability to learn science, becoming scientific investigators, learning to collect and analyze data, and learning to communicate findings and conclusions.

The materials provide suggestions for teachers on how to use time, physical space, and manipulative materials in ways to facilitate learning and how to teach students to work in cooperative and collaborative groups.

The materials provide suggestions for multiple methods of assessing student progress.

The materials provide suggestions for how families can be involved in the programs and support and encourage student learning.

Assessment

The student assessment materials in the curriculum provide teachers with information about what students know, how they think, what they can do, and how they feel. The assessment must be aligned with the state Curriculum Frameworks (Science and Mathematics). The assessment matches the instructional purpose and is directly relevant to the student learning experience(s).

The program should include multiple means of assessment that are integrated across the curriculum. Assessment tasks should be broad in scope and should evaluate the extent to which students can apply concepts to new situations. Assessment activities should make appropriate use of technology.

Assessment is integrated into the curriculum. Assessment activities are similar to learning activities and help teachers determine the extent to which students have processed information and whether they can apply it to problem solving situations.

Multiple means of assessment such as observations, oral and written work, student demonstration, and cooperative learning activities are included. The appropriate use of technology is built into assessment activities.

All aspects of scientific knowledge are assessed, including conceptual understanding, procedural knowledge, and attitudes about mathematics.

All aspects of mathematical knowledge are assessed, including conceptual understanding, procedural knowledge, and attitudes about mathematics.

External and internal assessments are coherent with the focus of instruction and learning strategies used in the classroom. There is alignment and coordination between external and internal assessment measures.

The program ensures that students understand the purpose(s) and utilization of assessment. It is evident that the assessment activities/procedures are fair and purposeful.

Assessment is equitable. Judgments about students' science and mathematics learning reflect the ways in which students' unique qualities influence how they learn and how they communicate that knowledge.

Considering Supplemental Materials/Programs

It should be noted that supplemental instructional materials should also be examined using this document. Teachers, administrators, and students should be aware of the multitude of materials and programs available and should seriously critique all materials used in the curriculum. Teachers and school staff should be sure that the materials or programs selected truly fit into the curriculum and provide meaningful learning for students. The urge to add flashy or "just-for-fun" activities should be avoided.

The most useful instructional materials and programs are those that utilize materials and supplies that are provided or easily obtained. They are easy to use and note any additional resources that are required.

Summary

The most important points made in this document are:

Programs and materials provide and support active experiences for the learner that are in-depth investigations into meaningful topics and concepts.

Assessment is a continuous, meaningful, and integral part of the teaching and learning process. Assessment reflects the instructional practices utilized in the classroom and is equitable for all students.

The content of the curriculum (scope, sequence, and program) hold a fundamental respect for scientific methods of inquiry and problem solving, mathematical problem solving and reasoning, and for the language and philosophy of mathematics and science as reflected in the Florida Curriculum Frameworks in Science and Mathematics; NCTM *Curriculum and Evaluation Standards for School Mathematics;* NCTM *Assessment Standards for School Mathematics; National Science Education Standards; Project Scope, Sequence, and Coordination of Secondary School Science;* and AAAS *Benchmarks for Science Literacy.*

Choosing Quality Mathematics & Science Materials and Programs Checklist

Directions

This checklist is intended to be utilized by educators to examine and evaluate instructional materials. It is organized into three sections: *Contextual View, Examine Closer, and Verification.*

The four questions under *Contextual View* are intended to be the filter for the instructional materials. If those questions cannot be answered positively, then the materials should not be considered for use with students. If the questions can be answered positively, then the materials should be analyzed using the questions posed under *Examine Closer* and then confirmed with the *Verification* section.

Contextual View

____ Are the materials/activities safe for both the teacher and the students and/or include the appropriate safety precautions and directions?
____ Do the materials stimulate students' interest and relate to their daily lives?
____ Do the materials actively engage the students in learning?
____ Do the materials contain substantive ideas and strategies?

Examine Closer

Do the materials stimulate students' interest and relate to their daily lives?

____ Are the materials appropriate for diverse student populations and diverse learning styles?
____ Are the materials, instructional strategies, and assessments bias free and do they promote equity (culture, gender, ability, etc.)?
____ Do the materials reflect the high expectations for ALL students regardless of race, culture, gender, religion, physical ability, or socioeconomic status?
____ Does the material/activity utilize and model for the teacher and learner appropriate use of technology?
____ Are there connections made with real world life situations and within disciplines?

Do the materials actively engage students in learning?

____ Do the materials provide numerous and varied experiences that require students to reason and think critically, use problem solving techniques, and promote higher level thinking?
____ Do the materials present a logical sequence of related activities that will help students build conceptual understanding through multiple learning opportunities?
____ Do the materials provide the learner opportunities to communicate ideas orally and in writing in the development of the appropriate language of science and/or mathematics?
____ Do the materials provide opportunities for students to express in a variety of ways what they know, can do, and how they think about math and science?
____ Does the material/activity provide opportunities for students to work both independently and collaboratively with others?

Do the materials contain substantive ideas and strategies?

____ Do the materials provide students opportunities to investigate important mathematics and science concepts in depth over an extended period of time?
____ Do the materials use multiple means of assessment that can be integrated with instruction?
____ Do the materials address the domains in mathematics and science described in the national standards and the state frameworks?
____ Do the materials allow teachers to take into account the students' prior knowledge, experience, and prerequisite skills?

Other considerations

____ Are the materials and activities safe?
____ Do the materials/activities meet rules, regulations, and policies?
____ Are the materials accurate, error-free, and up-to-date?
____ Are the materials cost effective?
____ Are the materials readily available?

Verification

____ Do the materials/activities incorporate appropriate research, strategies, and methods?
____ Can the material/activity be adapted or modified to meet the needs of the students or program?
____ Is the assessment relevant, unbiased, and aligned with instruction?

How Equitable is Your Science Education Program?

Programs for Educational Opportunity
Equity Coalition, Fall 1993–Spring 1994
by Martha A. Adler, Field Service Specialist

Directions

Answer each question with a YES or NO, even if some of the questions deal with a grade level with which you are unfamiliar. If possible, respond to the checklist as a member of a multicultural, gender representative team that includes administrators, teachers, parents, and students across grade levels. When necessary, collect information to substantiate your answers.

I. Science Education in General

Does the implementation of your district's/school's science instruction and curriculum:

____ 1. Incorporate hands-on activities on a regular basis?
____ 2. Include cooperative learning activities routinely?
____ 3. Emphasize problem solving and content equally?
____ 4. Allow students opportunities to talk about their science learning?
____ 5. Relate textbook knowledge to the science in the everyday lives of our culturally diverse society?
____ 6. Include career information on a regular basis?
____ 7. Include role models who represent both genders and people of different racial, cultural, and linguistic groups for students to interact with on a regular basis?
____ 8. Assure equal experience for all students with available technology/equipment?
____ 9. Promote the integration of the science curriculum with other core disciplines (such as literature, language arts, mathematics, and social studies)?
____ 10. Aim at developing and encouraging positive attitudes for teachers, administration, parents, and students toward science?
____ 11. Develop and monitor partnerships with science and industry that include participation and representation of both genders and people of different racial, cultural, and linguistic groups?
____ 12. Assess students with performance-based criteria which emphasizes the open-ended nature of science and the importance of using language for description and questioning?
____ 13. Assure that counselors, teaching staff, and parents are aware of strategies that encourage equitable participation of female and minority students in science?
____ 14. Monitor all teaching materials (filmstrips, videos, textbooks, posters, bulletin board displays) for their equal representation of both genders and people of different racial, cultural, and linguistic groups in the science community?

II. Science in PreK–Upper Elementary

In supporting your science curriculum, does your district/school:

____ 15. Provide inservice training for all teachers to update and improve their science instruction skills?
____ 16. Support and train teachers who are uncomfortable teaching science?
____ 17. Emphasize accountability for teaching science on a regular basis in all classrooms?
____ 18. Encourage and facilitate out-of-school learning experiences at all levels and for all skill groups?
____ 19. Monitor extracurricular science activities (such as annual science fairs) for equitable representation of students of both genders and of different racial, cultural, and linguistic groups?
____ 20. Establish guidelines for science fair projects that de-emphasize the "wow" effect of experiments and encourage children to

formulate their own questions and explore science in their own natural environments?

____ 21. Publicly acknowledge its strong commitment to science as an integral part of the school curriculum, rather than as enrichment?

____ 22. Provide assistance for teachers in obtaining the necessary materials and equipment for teaching science with an experimental emphasis?

____ 23. Form partnerships with parents to define their roles in supporting science education for their children?

____ 24. De-emphasize the textbook approach to science in favor of an experience-based approach?

____ 25. Do outreach efforts that include parents who are representative of the entire student population on decisions regarding science activities and explorations with children?

III. Science in Secondary School

In supporting you science program does your district/school:

____ 26. Make sure that students of both genders and of different racial, cultural, and linguistic backgrounds have equal access to all science courses?

____ 27. Require all students to take a core set of courses in biological and physical sciences that integrates both quantitative and descriptive methodologies?

____ 28. Monitor course content so that no student is left with a "watered-down" science curriculum?

____ 29. Make sure that all selections from the core set of courses be comparable (e.g., home economics is not allowed to substitute for biology)?

____ 30. Monitor enrollments for equitable representation of students of both genders and of racial, cultural, and linguistic groups in advanced placement classes?

____ 31. Monitor lab partner assignments so that students share equally in all aspects of lab work, including setting up, conducting the experiment, writing the lab report, and cleaning up?

____ 32. Assign highly qualified teachers to core science courses, making sure that they are representative of both genders and of different racial, cultural, and linguistic groups?

____ 33. Monitor career day programs for representation from a variety of science careers with career models who represent the diversity within the school community?

____ 34. Assure that counselors and teaching staff affirm and promote the participation of students of both genders and of different racial, cultural, and linguistic groups in science-related careers?

____ 35. Assure that students have equal experience with extracurricular activities (such as science clubs, science fairs, or "Science Olympiad" programs)?

____ 36. Form partnerships with parents to define their roles in supporting the science education and future careers of their children?

Scoring the Checklist

Score ONE POINT for each YES answer. If you have responded to the entire checklist, then score one point for each of the questions in part I (1-14), one point for each of the questions in part II (15-25), and one point for each of the questions on part III (26-36).

I. Science Education in General

30-36 points *Congratulations!* You have equity in proper perspective.

20-29 points *Good start, keep working at it!* You have the elements of a good beginning. Examine each NO answer. Can you group any of these questions into categories? Do they fall along grade level or another category? Bring these issues up with your school/district in order to improve the status of science education for all students in your system.

0-19 points *It's never too late!* Examine the areas where you were able to respond positively. What has made it possible for these to be incorporated for science education in your district/school? Then examine the questions where you

BEST COPY AVAILABLE

responded negatively. Try to identify possible barriers and solutions to bring your school/district up to a more equitable level of educating all students in science.

II. PreK–Upper Elementary

If you have responded as an individual with a PreK–Upper Elementary perspective, then score one point for each of the questions in part I (1-14) and one point for each of the questions in part II (15-25).

20-25 points *Congratulations!* Share what you do with other schools/districts. And take a look at what's happening at the secondary level in your district.

10-19 points *Good start, keep working at it!* You have the elements of a good beginning. Group the questions together by your negative and positive responses. Do you see any pattern? What is working for your district/school at this grade level? What's missing? Share this checklist with others in order to develop a plan of action and strategies for how you can improve.

0-9 points *It's never too late!* Examine the areas where you were able to respond positively. What has made it possible for these to be incorporated for science education in your district/school? Then examine the questions where you responded negatively. Try to identify possible barriers and solutions to bring your school/district up to a more equitable level of educating all students in science.

III. Science in Secondary Schools

If you have responded as an individual with a middle/junior–high school perspective, score one point for each of the questions in part I (1-14) and one point for each of the questions in part III (26-36). Use the same scoring as described above for part II, PreK–Upper Elementary.

Glossary of Terms

AAAS American Association for the Advancement of Science

Active Learning Learning experiences that vigorously engage the student whether physical actions or cognitive functioning.

Appropriate use of technology Technology used for valid instructional purpose which is integral to or provides assistance in the teaching and learning process. Technology can be used to analyze and organize data, calculate numerical results, and solve problems. For example, the use of calculators and computers as tools for students to solve problems.

Assessing student progress Information about what students know and are able to do, how they think, and how they feel. Assessment tasks should be broad in scope and evaluate the extent to which students can apply concepts to new situations. Multiple means of assessment are used, including observations, oral and written work, student demonstrations, and cooperative learning activities. The use of technology is built into assessment activities where appropriate.

Coherence The quality of logical connection and orderly relationship of parts.

Concepts General and fundamental ideas.

Constructivism An approach to teaching and learning based on the premise that cognition (learning) is the result of "mental construction;" in other words, students learn by fitting new information together with what they already know; also constructivists believe that learning is affected by the context in which an idea is taught as well as by students' beliefs and attitudes.

Curriculum The **what** (scope), **when** (sequence), and **how** (program) of an instructional plan for students. The scope is the content, skills, and attitudes that are a part of the program. The scope addresses how much is taught and of what variety. The sequence defines what is taught at which levels and in which courses. The program is the experiences that students encounter and the strategies and methods that teachers employ.

Developmentally inappropriate The match between the learning task and the student's cognitive, social, or physical ability to perform the task successfully.

Discourse The verbal engagement of students in discussion, reflection, and analytical conversation.

Equitable assessment The degree to which the process of gathering evidence has provided opportunities

equally appropriate for each student to demonstrate the valued thinking processes, knowledge, and skills that he or she has developed. Equitable assessment is not achieved by creating the same conditions for all students but rather by creating conditions that are appropriate to the same extent for each student.

Equity The state or quality of being fair, just, and equally appropriate for all students.

Grouping Cooperative and collaborative groups are two different ways to arrange students' learning environments.

Habits of mind Attitudes that enable students to be creative and critical thinkers and problem solvers. For example, curiosity, honesty, objectivity, skepticism, creativity, tolerance, and open-mindedness.

Integration Refers to connections among topics within the discipline of mathematics or science (i.e., geometry connected with algebra or biology connected with chemistry) and between mathematics and science (i.e., estimation with population counts) and the real world.

Inquiry A process through which students investigate a problem, devise and work through a plan to solve the problem, and propose a solution to the problem.

NCTM National Council of Teachers of Mathematics

NSTA National Science Teachers Association

Nature of Mathematics is the development of a repertoire of heuristic problem solving strategies.

Nature of Science is presented as being open to inquiry, open to controversy, and nondogmatic in substance.

Process skills Abilities used to explore, gather, interpret, and communicate data. Examples include observing, classifying, measuring, interpreting data, inferring, communicating, controlling variables, developing models and theories, hypothesizing, and predicting.

Quality Degree of excellence.

Reasoning To determine or conclude by logical thinking.

Supplemental instructional materials Elements added to strengthen or extend the primary instructional materials.

Bibliography

American Association for the Advancement of Science. (1993). *Benchmarks for Science Literacy*, Washington, D.C.

California Department of Education. (1993). *Science Frameworks for California Public Schools, K-12.*

National Academy of Sciences. (1994). *National Science Education Standards.* Washington, D.C.

National Council of Supervisors of Mathematics. (1994). *Supporting Leaders in Mathematics Education, A Sourcebook of Essential Information.* Reston, Virginia. NCTM.

National Council of Teachers of Mathematics. (1993). *Curriculum and Evaluation Standards for School Mathematics.* Reston, Virginia. NCTM.

South Carolina Department of Education. *South Carolina Mathematics Curriculum Framework.* Columbia, South Carolina.

Task Force for Improving Mathematics, Science, and Computer Education. (1989). *A Comprehensive Plan: Improving Mathematics, Science, and Computer Education in Florida.* Tallahassee, Florida: The Florida Chamber of Commerce and the Florida Department of Education.

References

The Association of State Supervisors of Mathematics and The National Council of Supervisors of Mathematics. (1993). *Guide to Selecting Instructional Materials for Mathematics Education.*

Blame and Nuely. (1991). *A Guide for Reviewing School Mathematics Programs.*

Bureau of Career Development and Educational Improvement: Florida Department of Education. (1991). *Florida Model Curriculum Project: Mathematics Grade K-5.* Tallahassee, Florida.

Florida Department of Education. (1993). *Science for All Students: The Florida preK-12 Science Curriculum Framework.* Tallahassee, Florida.

Florida Department of Education. (1993). *Mathematics Excellence for All: The Florida K-12 Mathematics Curriculum Framework.* Tallahassee, Florida.

National Science Resources Center, Smithsonian Institution, National Academy of Sciences. *Science Instructional Materials Review Form.* Washington, D.C.

National Science Teachers Association. (1995). *Project for Scope, Sequence, and Coordination of Secondary School Science.* Washington, D.C.

South Dakota Equity Standards in Education

APPENDIX II

Developed by the South Dakota SERA Statewide Action Committee

1995

(reprinted with permission of the authors)

South Dakota Equity Standards in Education

Introduction

The South Dakota SERA Project is guided by a 70-member Statewide Action Committee, which meets quarterly to assist the South Dakota National Science Foundation Statewide Systemic Initiative and the South Dakota Department of Education and Cultural Affairs in strengthening equity in education. Members of this Committee represent the following organizations and programs:

Sinte Gleska University ◆ Todd County Schools ◆ South Dakota National Science Foundation Statewide Systemic Initiative ◆ Tiospa Zina Tribal School ◆ South Dakota State University-Child Development ◆ Crazy Horse School ◆ Douglas Schools ◆ South Dakota Initiative for Challenging Standards ◆ Science Linkages in the Community Project ◆ Takini School ◆ South Dakota Board of Regents ◆ South Dakota Education Association-Office of Educational Innovation ◆ Bureau of Indian Affairs ◆ Oglala Lakota College ◆ Pine Ridge School ◆ South Dakota Curriculum Center ◆ Scientific Knowledge for Indian Learning and Leadership Project ◆ Girls Inc. ◆ South Dakota American Association of University Women ◆ Technology and Innovations in Education ◆ South Dakota Department of Education and Cultural Affairs: Indian Education, Drug-Free Schools, Special Education, State Testing, Guidance, Civil Rights, Equal Education Opportunities, Bilingual Education, Title I, Even Start, Headstart, Teacher Education and Certification, and Sex Equity-Office of Adult, Vocational, and Technical Education.

Part I—Background

The equity goal of the SERA Statewide Action Committee is to "Promote equal opportunities for learning science, mathematics, and technology by removing inequities based on gender, race, socio-economic status, ethnicity, disabilities, rural isolation, and other factors that may affect students' learning and self-esteem."

Equity **for students** is limited when:

- teachers' preconceived notions of students, such as gender roles, cultural background, or socio-economic status roles, determine how they interact and teach students;
- equity is only legislated and not lived; or,
- equity is only viewed from a narrow perspective, such as in terms of money, as involving only one community or school, or as a separate class or unit.

Equity **in education** means a quality education for all **learners**, where all learners:

- experience comfort and safety in schools;
- feel accepted by others;
- have respect for others;
- feel invited to learn;
- are connected with the community-at-large; and,
- are part of a learning community.

In this equitable learning environment, **teachers, students, administrators, parents, community, and school boards:**

- know their biases about people;
- work to counteract their personal biases;
- work together within schools as a part of a learning community that supports making changes to increase equity;
- are informed of under-represented populations in math, science, and technology;
- create nurturing learning environments for all students by accommodating students' learning styles, cultural values, ethnic influences, rates of learning, socio-economic influences, etc.; and,
- are committed to having all students learn and succeed.

Why Promote Equity?

Unless communities create equitable learning environments, two things will happen. First, many students will be excluded from the sphere of learning and,

BEST COPY AVAILABLE

therefore, will not be fully prepared to participate in the work force of the future or to lead full lives. This places a heavy financial burden on the existing work force. Second, leaving some students out of the learning process condones acceptance of discrimination and bias and strengthens the current inequitable system. Consequently, many people are lost to active full participation in society, AND our school systems continue to limit the potential of individuals who have been excluded.

To facilitate the implementation of equitable learning environments in South Dakota, the SERA Statewide Action Committee developed the following standards for schools, districts, and teacher education programs based on equity benchmarks developed in Vermont. We realize these Equity Standards cover a wide range, from specific categories to long-term goals. Our purpose is to provide some guidance in this effort.

Part 2—Equity Standards for South Dakota

School and Classroom Climate

- All students experience comfort and safety in preschool and school.
- All students feel accepted by other students and staff.
- All students respect others.
- All students feel invited to learn.
- Teachers ask students for feedback about classroom climate.
- Using student feedback, teachers change the classroom environment to increase learning.
- Teachers and students interact with mutual respect.

Curriculum

- Instructional materials are regularly reviewed to promote diversity and eliminate bias.
- Instructional materials are free of bias and represent the social diversity of the United States.
- All students have access to high quality instructional resources (books, science and mathematics materials and manipulatives, calculators, and computers).
- All students have opportunities to perform in algebra, geometry, calculus, physics, biology, chemistry, and other math and science units or courses throughout the grades.
- Course enrollment is not based on ability tracking.
- School libraries include materials about contributions of racial and ethnic minorities, disabled people, and women.
- Library materials, curriculum materials, and guidance materials are continuously updated and reviewed to be free of stereotypes and to represent the social diversity of the United States.
- Classroom climate and teaching strategies provide every student an equitable opportunity to learn.

Assessment

- Methods of student assessment are sensitive to diverse student populations.
- Methods of student assessment are sensitive to diverse student learning cycles.
- Baseline data is collected and disaggregated by gender, race, ethnicity, disability, and economic levels.
- Methods and instruments of assessment are free of bias.
- Over time, assessment demonstrates significant increase in the rate of achievement of students traditionally under-represented in mathematics, science, and technology.

Professional Development

- School districts provide all teachers with ongoing professional development opportunities.
- School districts support teachers in the instruction of diverse student populations.
- Professional development activities address equity and diversity in the preschool and K-12 classrooms.
- All professional development activities integrate equity in content and/or pedagogical concepts.

Management and Governance

- Districts have at least one School Board-adopted policy that increases equity for students.
- Districts have a plan translating their equity policy into action.
- Policy and procedures are disseminated to the School Board, parents, teachers, administrators, students, and community.
- District hiring policies and procedures reflect the diversity of the student population.
- Resources are appropriately allocated to foster equity as related to curriculum, instruction, learning, and assessment.

- Student and teacher rights are protected with the district's policies and procedures.

Community Outreach

- All students are connected with the community-at-large.
- All students are part of learning.
- Methods for outreach to parents are varied to effectively reach non-reading and non-English speaking parents.
- Outreach activities empower parents to be engaged in their children's education.
- Community partnerships acknowledge that several communities exist within the larger community, and all constituents are represented in leadership and activities.
- Schools promote alliances between people of different backgrounds who represent the several communities that exist within the larger community.
- Collaboratives and coalitions are formed with business partners that include minority-owned businesses.
- Schools sponsor at least one activity per year to increase public awareness of the need to address inequities.
- All materials developed by schools (newsletters, forms, curriculum materials, letters, awards, etc.) are inclusive and free of stereotyping.

Access to Technology

- All students have access to high-level and high-interest courses that advance the student's understanding of, and ability to use, emerging technologies.
- All students and educators have access to technology equipment, education, and personal development opportunities.
- All superintendents, principals, and teachers use technology and telecommunications on a regular basis.
- Plans are in place to expand telecommunications access to students and teachers.
- Districts have an ongoing technology plan including the assessment and acquisition of technology.

Part 3—Where Are You Now?

The following questions are designed to help assess existing educational equity in your preschool/school/district/education program. The resulting baseline information can guide possible efforts, directions, and strategies for meeting the Equity Standards. In addition to using these questions, we suggest you:

- Survey students about:
  - classroom and school climate;
  - equitable attitudes and respect for others; and,
  - how accessible they see learning opportunities.
- Survey teachers about:
  - school climate;
  - equitable attitudes and respect for others; and,
  - access to professional development opportunities.
- Ask parents if they feel included in the school and ask them to identify more effective ways to increase their access to the school.

Equity Reality Check

Curriculum and Climate

____ All students, at every grade level, use manipulatives, calculators and computers.
____ All students, at every grade level, use science apparatus.
____ My school library has books about the contribution of women in science, mathematics, and technology.
____ My school library has books about the contributions of Native Americans, Afro-Americans, Hispanics, and Asian-Americans in science, mathematics, and technology.
____ My school library continuously updates materials and seeks to replace biased, stereotypic resources.
____ My school library has books about the contributions to science, mathematics, and technology by people with disabilities.
____ I see evidence in my school of students treating each other with respect.
____ I see evidence in my school of teachers treating every student respectfully as an individual.
____ Science classes are not tracked.
____ Math classes are not tracked.
____ Textbooks, library books, other curriculum materials, and guidance materials are all reviewed

BEST COPY AVAILABLE

annually to ensure they are inclusive, represent diversity, and encourage students to participate in learning.

____ Math, science, and technology courses are scheduled in ways that encourage student participation.

Assessment

____ Teachers use a variety of assessment strategies.

____ Teachers use assessment strategies that are sensitive to diverse student populations and learning styles.

____ Assessment tools used in my school are unbiased for gender, limited English speaking students, limited economic level students, etc.

____ Standardized test scores for students at my school show no differences based on gender, economic level, disability, race, or ethnicity.

____ If standardized test scores DO show differences, my school is demonstrating increases in the rate of achievement for under-represented groups.

Professional Development

____ My school offers ongoing professional development opportunities for teachers.

____ Teachers and administrators in my school attend equity-related professional development opportunities.

____ My school offers professional development that integrates equity and diversity in content and/or pedagogical concepts.

____ My school provides appropriate resource support for effective instruction.

Management and Governance

____ My district has a policy supporting equity for students.

____ My district has a plan that translates our equity policies into action.

____ Policies and procedures have been disseminated to all school board members.

____ Policies and procedures have been disseminated to all parents.

____ Policies and procedures have been disseminated to all teachers.

____ Policies and procedures have been disseminated to all administrators.

____ My district's policies relate equity to curriculum, instruction, learning, and assessment.

____ Policies and procedures have been disseminated to all community members.

____ The district's policies and procedures protect student and teacher rights.

____ Policies and procedures have been disseminated to all students.

Community Outreach

____ A review of outreach materials shows that they are inclusive (welcoming all family groupings, translated into languages other than English when appropriate, etc.) and free of stereotyping.

____ Programs such as FAMILY MATH and FAMILY SCIENCE are offered to parents.

____ My school sponsors at least one activity per year designed to increase awareness of the need to recognize and address inequities.

____ All materials developed by my school use inclusive language; i.e., do not exclude single parents, do not use generic "he", etc.

____ All materials developed by my school use inclusive graphics.

____ All data collected by my district/school is reported to the public on a yearly basis analyzed by gender, race, ethnicity, disability, and income.

Access to Technology

____ Computers are used in science and mathematics by all students.

____ Technology is used to increase student achievement.

____ Students and staff access, evaluate, and communicate information using technology.

____ All students and staff have access to computer technology, telecommunications technology, interactive media, and instructional and management technology.

____ Telecommunications learning is supported in my school.

____ Computer technologies are used to broaden students' procedural skills for investigating,

solving complex problems, making decisions, and presenting and sharing knowledge.

____ Telecommunications supports learning in my school.

____ All teachers have access to telecommunications in my school.

____ All students have keyboarding skills.

____ Every student can use word processing to write an essay.

____ Teachers and the principal and superintendent use telecommunications to link with the South Dakota Department of Education and Cultural Affairs and others.

Equity Resources in South Dakota

South Dakota Department of Education and Cultural Affairs
Janet Martin, Education Program Representative, Office of Technical Assistance, current SERA Coordinator
Deb Rumrill, past SERA Coordinator
Don Schanandore, Education Program Representative, Title V-Indian Education
Gloria Smith, State Equity Supervisor
Margo Heinert, Equal Education Opportunities/Bilingual Education/Civil Rights
Kneip Building
700 Governor's Drive
Pierre, SD 57501
(605) 773-4699

South Dakota Equity Advisory Committee
Nancy Gacke, President
Southeast Technical Institute
2301 Career Place
Sioux Falls, SD 57107
(605) 331-7624

South Dakota Education Association
Elaine Roberts, President
411 E. Capitol
Pierre, SD 57501
(605) 224-9263

Technology and Innovations in Education, Inc.
James Perry, Director
1925 Plaza Boulevard
Rapid City, SD 57702
(605) 394-1876

South Dakota American Association of University Women
Jeanne Jones Manzer, President
929 Fourth St.
Brookings, SD 57066
(605) 692-7684

Sinte Gleska University
Doris Leader Charge, Chairperson
Lakota Studies Department
P.O. Box 490
Rosebud, SD 57570
(605) 856-4463

Girls Incorporated
Sherri Price, Director
910 Wood Ave.
P.O. Box 2813
Rapid City, SD 57709
(605) 341-5010

Science Linkages in the Community
Margie Rosario, Director
South Dakota School of Mines & Technology
501 E. St. Joseph
Rapid City, SD 57701
(605) 394-2912

South Dakota Advocacy Services
Robert Kean, Executive Director
221 S. Central
Pierre, SD 57501
(605) 224-8294

Brief Descriptions of Several Equity Projects Referenced in Text

APPENDIX III

Brief Descriptions of Several Equity Projects Referenced in Text

CCSSO—Resource Center on Educational Equity

As noted on the CCSSO webpage, the Council's Resource Center on Educational Equity was established by chief state school officers to provide services designed to achieve equitable, high-quality education for all students, especially minorities, girls, disabled, limited English proficient, and low-income students. The Center does research and policy formulation, develops reports and other materials, operates grant and other action programs, provides capacity-building technical assistance to SEAs, holds working conferences, and monitors federal and state civil rights and education programs focused on disadvantaged students.

Collaboration for Equity: Fairness in Science and Mathematics Education

Individuals from the American Association for the Advancement of Science, the Education Development Center, Inc., Girls Incorporated, Campell-Kibler Associates, and the Urban Institute work together to change public and professional awareness and action about how to accomplish equity and excellence in mathematics and science. This project focuses on mechanisms to ensure that half the population—girls and women—have full opportunities and support to succeed in mathematics and science. To this end, the Collaboration has worked at expanding definitions of equity beyond simplistic notions to encompass the complex choices that policy makers and practitioners face; developed tools that respond to that complexity; and convened educational leaders and practitioners to provide them with a research base and a forum for action.

Statewide Systemic Initiatives (SSI)

This NSF program encourages improvements in science, mathematics, and technology education through comprehensive systemic changes in the education systems of the states. As described on the NSF statewide systemic initiatives homepage, state leadership is critical to school reform efforts both because states have the constitutional authority for education and because they are the only level of the education system that can effectively and directly influence preschool through higher education, including the preparation, certification, and continuing education of teachers. State leaders are in a position to coordinate resources from a variety of public and private sources, to allocate resources across the state fairly and equitably, and to secure the commitments necessary to sustain comprehensive reform efforts. Finally, through the policymaking process, state leaders create and modify laws and regulations that promote or inhibit educational reform.

Rural Systemic Initiatives (RSI)

As described on the NSF RSI Vision and Program Goals webpage, the RSI is focused on education for students in rural, economically disadvantaged regions of the nation, particularly those that have been underserved by NSF programs. Its goals are as follows:

- The improvement of SMT education in rural, economically disadvantaged regions of the nation.
- The preparation of a technologically competent workforce to enhance the infrastructure of economic development activities within a community or region, by strengthening the SMT instructional capacities of regional schools, colleges, and universities.
- The enhancement of scientific literacy and science understanding and appreciation among students and the general community in rural, economically disadvantaged regions of the nation.
- The development of community infrastructure to provide resources to sustain educational improvements.

Urban Systemic Initiatives (USI)

As noted on the NSF Urban Systemic Initiatives webpage, the USI was established to challenge the nation's commitment to effect sustained school reform in its urban centers. The importance of the USI is made apparent by the fact that urban school systems enroll approximately half of all public school students in the United States. Recent studies point to a continued disparity between the academic performance of these students and that of their counterparts in suburban schools. USI grant recipients are expected to launch systemic programs to foster experimentation, accelerate the rate of change, and implement system-wide improvement in student learning for grades K-12 in SMT.

As of October 1996, the following locations have a SSI, USI, or RSI award:

SSI

Arkansas
California
Colorado
Connecticut
Georgia
Kentucky
Louisiana
Maine
Massachusetts
Michigan
Nebraska
New Jersey
New Mexico
New York
Puerto Rico
South Carolina
Texas
Vermont

USI

Baltimore
Chicago
Cincinnati
Cleveland
Columbus
Dallas
Detroit
El Paso
Fresno
Los Angeles
Memphis
Miami
Milwaukee
New Orleans
New York City
Philadelphia
Phoenix
Ponce
San Antonio
San Juan
San Diego
St. Louis

RSI

Alaska Native/Rural Education Consortium
Appalachian Rural Systemic Initiative
High Plains Rural Systemic Initiative
Inter-Tribal Education Coalition for Rural Systemic Change
Lower Mississippi Delta
Utah-Colorado-Arizona-New Mexico SI

Comprehensive Partnerships for Mathematics and Science Achievement (CPMSA)

This NSF funded program supports activities that enhance the achievement of participating precollege students in order to increase their enrollment and success in science and mathematics. The program supports educational systemic reform in cities that are not eligible to participate in the USI program and have not received a local systemic change program award. City school systems, which are the units of change, are expected to link with institutions of higher education, community-based, and other educational organizations in the design and implementation of a combination of in-school students and teacher enhancement activities, as well as informal education efforts. The goals are as follows:

- To improve student achievement in mathematics and science courses.
- To enhance teacher knowledge and skills.
- To expand student interest in SMT as career choices.

As of October 1996, the following locations have a CPMSA award:

Birmingham Comprehensive Partnership for Mathematics and Science Achievement

Brownsville Engineering Alliance for Mathematics (Project Beam)

Chattanooga, Tennessee, Accessing Accelerated Achievement

Minority Initiative for Denver Schools (MINDS)

East Side Union, California, Comprehensive Partnership for Mathematics and Science Achievement

Hartford, Connecticut, Public Schools Comprehensive Partnership for Mathematics and Science Achievement

Jackson, Mississippi, Public Schools Comprehensive Partnership for Mathematics and Science Achievement

Jefferson County Partnership for Mathematics and Science Achievement

Newburgh, New York, Enlarged City School Districts Comprehensive Partnership for Mathematics and Science Achievement

Normandy School District, St. Louis, Missouri, Environments for Excellence: A Model for Increasing Science and Mathematics Enrollment in an Inner-Suburban Minority District

Omaha Project Banneker: Achieving Excellence in Mathematics and Science

Paramount, California, Unified School District Comprehensive Partnership for Mathematics and Science Achievement

Partnerships for Student Achievement in Science, Mathematics, and Technology in Prince George's County Public Schools

Roanoke River Valley, North Carolina Consortium: Partnerships to Enhance Student Achievement

Project SUCCESS—The Surry, Sussex, Charles City, and King and Queen Education Consortium Educating Students for Success

Winston-Salem/Forsyth County Comprehensive Partnership for Mathematics and Science Achievement (PROJECT JUST)

State Collaborative on Assessment and Student Standards (SCASS)—Science

To address the need for better information in schools and classrooms, the Council of Chief State School Officers initiated SCASS in 1992. This multi-state consortium pooled expertise and resources to apply state content standards and the *National Science Education Standards* as well as the *Benchmarks for Science Literacy* to develop science reform strategies and assessment tools. The SCASS science project links conceptually-oriented curricula, performance-based assessment, and a survey approach to measuring the enacted curriculum as means of informing and improving science education in member states.

As of November, 1996, there are ten states participating in SCASS:

Colorado
Iowa
Kentucky
Massachusetts
Missouri
Ohio
Oregon
Pennsylvania
South Carolina
West Virginia

List of Participants at State SERA-Sponsored Meetings

APPENDIX IV

Florida

Susan Avery, Administrator, Exceptional Education
Tom Baird, Project Director, Florida Statewide Systemic Initiative (SSI)
Marianne Barnes, Co-PI, Florida SSI and Jacksonville Urban Systemic Initiative (USI)
Mary Hackenburg, Jacksonville USI and State Science Supervisor
Vera Hirsch, Miami USI
Sharon Koon, Florida SSI
Wayne Largent, Supervisor, Educational Programs
Laura Newton (in place of Nancy Brenda, Director, Equal Educational Opportunity Program)
Peggy Primicerio, District Eisenhower Coordinator
Sandra Ricardo-Wilcox (in place of Lisa Gale, Program Director, Mulitcultural Education)
Anita Sandler, Miami USI
Donna Szpyrka, Regional Coordinator, Florida SSI
Lew Wagar, Postsecondary Eisenhower Coordinator
Marsha Weingarner, Science Specialist, Curriculum Services and Assessment

Michigan

Charles Allan, Michigan Department of Education
Gary Appel, MSSI
Mary Bailey-Hengesh, Michigan Department of Education
Zoe Barley, Western Michigan University
Joyce Beasley, Roegan Enterprises
Paul Bielawski, Michigan Department of Education
Lisa Bond-Brewer, MSSI
Mary Bradley, Michigan Department of Education
Pat Buczynski
Jason Butki, Michigan Department of Education
Ann Byer, Ann Arbor Public Schools
Ana Cardona, Michigan Department of Education
Kathy Crooks, Michigan Department of Education
Arthur Dudley, Steering Committee
Brenda Earhart, Kalamazoo Math and Science
Linda Forward, Michigan Department of Education
Joyce Gooder, Michigan Department of Education
Chuck Gosdzinski, Michigan Department of Education
Sue Harrison, Michigan Department of Education
Roxana Hopkins, Michigan Department of Education
Gloria Jackson, Detroit Public Schools
Mark Jenness, Western Michigan University
Mozell Lang, Michigan Department of Education
Patty Loncharich, Michigan Department of Education
Sue McGee, Michigan Department of Education
Nancy Mincemoyer, MSSI
Stephanie Randolph, General Motors
Andre Reddick, Public Education Fund
Miguel Ruiz, Michigan Department of Education
David Smith, MSSI
Gwendolyn Taylor, MSSI
Becky Thomas, Western Michigan University
Georgia VanAdestine, Governor's Office
Erwin Vance, Michigan State University
Nancy Wing, Michigan Department of Education

South Dakota

John Bonaiuto, Department of Education
Jim Hauck, Department of Education
Don Schanandore, Department of Education
Connie Colwill, Department of Education
Betsy Pollock, Department of Education
Betty Bowers, Department of Education
Margo Heinert, South Dakota NSF-SSI
Janet Martin, South Dakota NSF-SSI
Deborah Rumrill, South Dakota NSF-SSI
Robert Magelky, South Dakota NSF-SSI
Joan Dutt, South Dakota NSF-SSI
Lucille Cudmore, South Dakota NSF-SSI
Greg Kludt, South Dakota NSF-SSI
Molly Linstrom, South Dakota NSF-SSI
Mitch Chapel, Modernization West Regional Coordinator
Blossom Keeble, Sisseton Education Agency, BIA
Sherry Dawn Red Owl, Rosebud Tribal Education Director
Richard Bordeaux, Todd County School District
Leland Bordeaux, Sinte Gleska University
Dennis Gasper, Todd County School District
Carolyn Johnston, Oglala Lakota College
Elaine Murphy, Oglala Lakota College
Ken Engelhardt, Takini School
Betty Belkham, Lower Brule School System
Roger Bordeaux, Tiospa Zina Tribal School
Sara McCulloh, South Dakota School of Mines and Technology
Margie Rosario, SLIC Project Director
Madonna Goodart, SLIC Project Director

75

Patty Wells, Office of Indian Education
Betty Williams, George S. Mickelson Alternative School
Bonnie London, South Dakota Advocacy Services
Ethelle Bean, South Dakota State University
John Mills, Dakota Link Project
Linroy Kilgore, Technology and Innovations in Education
Judy Branum, South Dakota State University
Janet Wilson, South Dakota Education Association
John Haas, Pine Ridge School
Karen Halligan, Rosebud Education Agency
Dennis Schutt

AAAS/SERA Staff & Consultants

Robert Berendt, Consultant
Cynthia Brown, CCSSO
Bernard Charles, Westat*McKenzie Consortium
Yolanda George, AAAS
Eric Jolly, Education Development Center, Inc.
Julia Lara, CCSSO
Shirley Malcom, AAAS
Carolee Matsumoto, Education Development Center, Inc.
William Pearson, Jr., Wake Forest University
Stephanie Robinson, The Education Trust
Barbara Sprung, Education Equity Concepts, Inc.

NSF Staff

Janice Earle
Sue Kemnitzer
Carolyn Mahoney

76

List of Participants at Equitable and Excellent Education for Girls Meeting
(Jointly Sponsored by the Collaboration for Equity and the CCSSO)

Appendix V

77

List of Participants at Equitable and Excellent Education for Girls Meeting (Jointly Sponsored by the Collaboration for Equity and the CCSSO)

Louis Adams-Rogers, Kentucky Department of Education
Scott Bean, Utah Office of Education
Judi Billings, Washington Department of Public Instruction
Cynthia Brown, Resource on Education Equity
Patricia Campbell, Collaboration for Equity, Campbell-Kibler Associates
Beatriz Chu Clewell, Collaboration for Equity, The Urban Institute
Marc Drew, South Carolina Department of Education
Elizabeth Fennema, University of Wisconsin-Madison
Helen Foss, Delaware State Systemic Initiative
Eva Gavillán, Collaboration for Equity, AAAS
Yolanda S. George, AAAS
Carol Gregory, Washington Department of Public Instruction
June Gregory, District of Columbia Public Schools
Ann Hansen, Michigan Department of Education
Gerald Hasselman, Mississippi Department of Education
Jan Hawkins, Education Development Center, Inc.
Heather Johnston-Nicholson, Collaboration for Equity, Girls Incorporated
Eric Jolly, Education and Development Center, Inc.
Marilyn Jordan, North Carolina Board of Science and Technology
Jane Butler Kahle, Miami University
Charlotte Kenney, Vermont Department of Education
Mike Kestner, North Carolina Department of Public Instruction
Nancy Kreinberg, Collaboration for Equity
Julio Lopez-Ferrao, National Science Foundation
Richard Laughlin, Colorado Department of Education
Nan Little, University of Washington
Rebecca Lubetkin, New Jersey SSI
Shirley Malcom, AAAS
Carolee Matsumoto, Education Development Center, Inc.
Patricia McGowan, University of Washington
Susan McKevitt, New Hampshire Department of Education
Wendy Micklus, Puget Sound Power & Light Company
M. Theresa Nichols, Desegregation and Equity Project
Kathleen Plato, Washington Department of Public Instruction
Rosalind Philips, Washington Science Teachers Association
Nancy Riestenberg, Minnesota Department of Children and Families and Learning
Wayne Sanstead, North Dakota Department of Public Instruction
Arna Souza, Washington State Mathematics Council
Lynn Steen, St. Olaf College
Thomas Stefonek, Wisconsin Department of Public Instruction
Judith Sunley, National Science Foundation
Jan Tuomi, National Research Council
Janelle Toman, South Dakota Department of Education
Peggy Vatter, OSPI
Ellen Wahl, Education Development Center, Inc.
Frank Walker, III, Rhode Island Department of Education
Karen Weida, Pacific Northwest Laboratories
Brenda West, West Virginia Department of Education
Susan Zelman, Missouri Department of Elementary and Secondary Education
Albert Zamora, New Mexico Department of Education

79

FUNDED BY CARNEGIE CORPORATION OF NEW YORK